HISTORICAL RECORDS OF THE SURVEY OF INDIA EIGHTEENTH CENTURY

Plate 1

2 Vols.

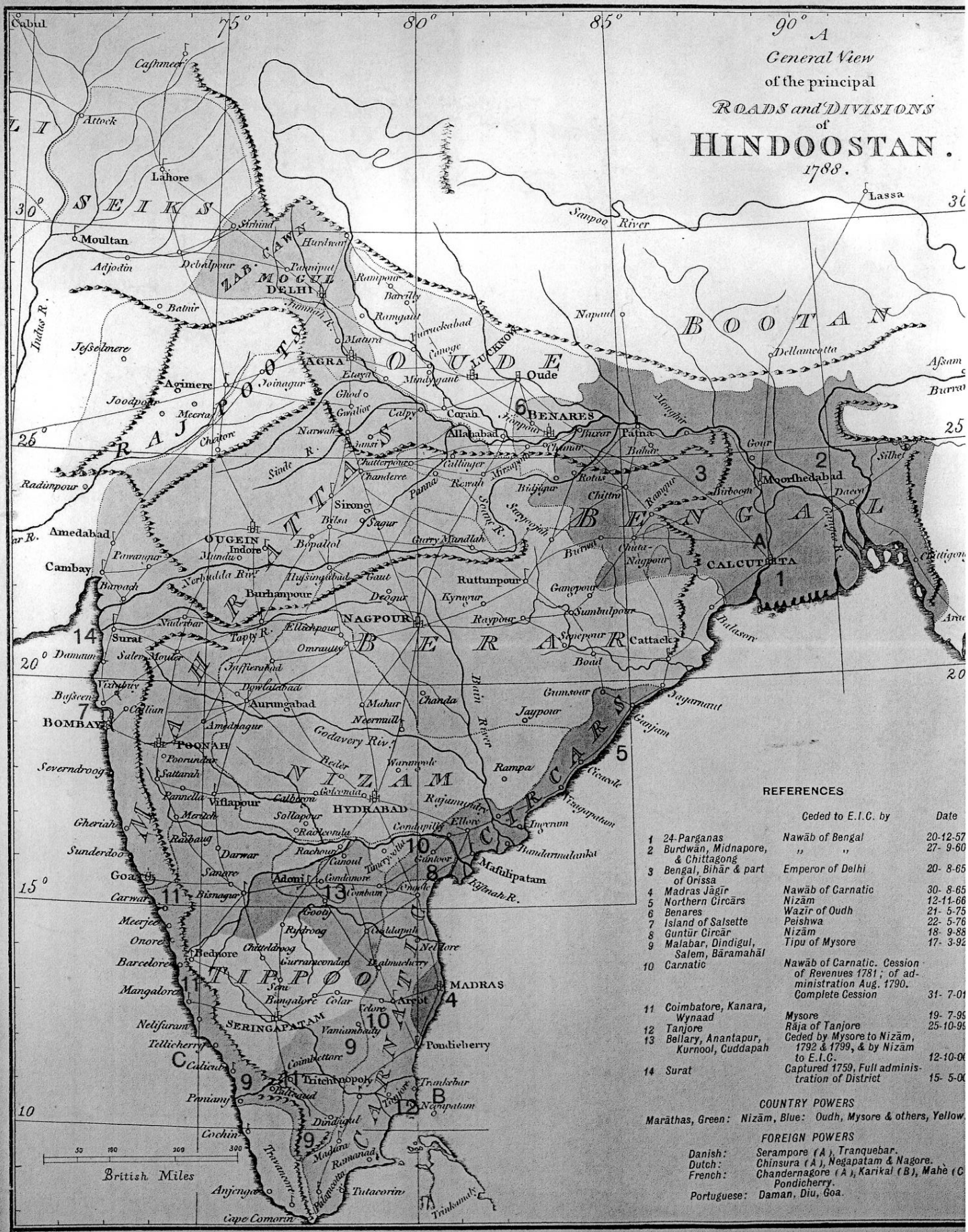


Reg. No. 64

POLITICAL MAP OF INDIA

Plate 1

Late 18th Century.



From map facing p. 235 of Rennell's *Memoir of a Map of Hindoostan*, 1788, with the addition of tints and a table of References.

Reg. No. 64 M.D 1939-600.

Published at S.I.O. Dehra

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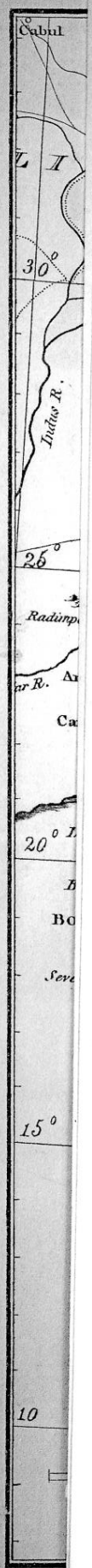
as reminder of Bangalore golf links
and the SS. MULTAN. 1914.

R. D. Shillimore

Dehra Dun.
7th Jun. 1947.

Vols I - II - III

Plate 1



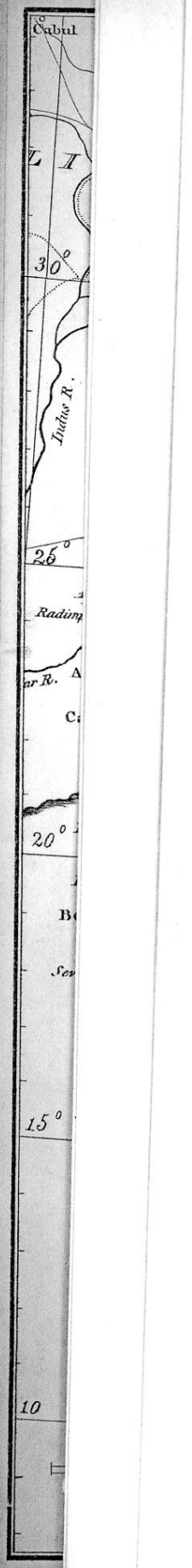
HISTORICAL RECORDS OF
THE SURVEY OF INDIA
EIGHTEENTH CENTURY

Published 1945

PRINTED IN INDIA

Reg. No. 64

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India. Survey of India Dept.

HISTORICAL RECORDS OF THE SURVEY OF INDIA

Volume I
18th CENTURY

Collected and compiled by
Colonel R. H. PHILLIMORE, C.I.E., D.S.O.,
(late Royal Engineers and Survey of India)

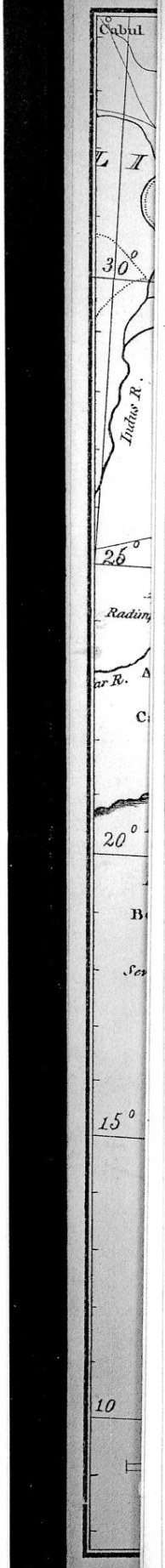


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1945

Price: Rs. 30 *or* £2. 7s. 3d.
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P54
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v. 1



L'avancement de la Géographie m'étant plus cher que la carte de l'Inde, je souhaite qu'elle ne soit que la preparation à une autre plus exacte et plus complète, qui .. ne lui laisse d'autre mérite que d'avoir donné lieu à une meilleure.

BOURGIGNON D'ANVILLE. 1752.

At that day we were compelled to receive information from others respecting the interior of the country, but in your time you *explored* for *yourselves*. I have only the merit of furnishing a dim light by which others groped their way.

RENNELL. 1808.

FOREWORD

From about 1860 onwards there are published reports describing the work of the Survey of India, and there are full accounts of the work of the Great Trigonometrical Survey from its start. We have, however, only the scantiest accounts of the inception and early development of surveys in India, and of the work of those great men who, from the simple beginnings of the 18th century, built up the Survey of India on sure lines, and established its reputation as a survey department second to none.

On his retirement from Government service in 1934, Colonel Phillimore undertook the monumental task of compiling a history of surveys in India from the earliest days. Interrupted by the war, during which he came back to duty with the department, it has been possible so far to publish only this first volume of his work, covering the 18th century, though much of the material for subsequent volumes has been collected. The research work has been immense; the records have come from a multitude of places; many have been rescued from oblivion; they have been studied, sorted, and compiled into an admirable history that is at once instructive and entertaining. We are indeed fortunate in having a historian who seeks to record not only accurate facts, but also the human interests and adventures of the early surveyors. It is fitting too that this historical volume should not only record the work actually carried out by a great survey department, but also form a record of the policy of the Court of Directors and their servants in India, and of their successors, towards maps and surveys.

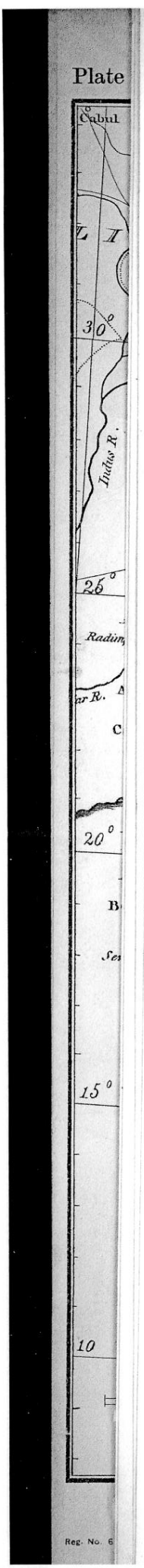
From the detailed accounts of the work carried out, the instruments and professional methods used, and the details of organization, financial control, and terms of service, we are able to observe the steady growth and consolidation of the department, and the gradual application of improved methods and instruments to meet the requirements of good government. It is instructive to observe the multifarious and increasing demands made on successive Surveyors General as the complexity of the administration increased.

His enthusiasm and long association of over forty years with the Survey of India make Colonel Phillimore peculiarly well qualified to undertake this labour of love. We and posterity will owe him a great debt of gratitude, and we sincerely hope that his ambition to carry this important history forward to 1883 may be achieved.

DEHRA DUN :
June 1945.

E. O. WHEELER,
Surveyor General of India.

9.11.56 Hefferman 20, 41 (3rd)



Addenda & Corrigenda

Page xx column 2 ; Wright, line 2 ; *for* Schlater *read* Sclater.
„ 1 line 19, *for* Pekin *read* Peking.
„ 2 line 10 from bottom ; *for* Willliam *read* William.
„ 10 after footnote 2, *add* , which obviously distorts Monserrate's arithmetic.
„ 17 footnote 5, *after* 1668–72, *insert* ; arrd. India 5–7–69, *v.* BM. Harl. MSS. 4254.
„ 26 line 23, *after* Verelst *insert* [22 n.4].
„ 30 line 7 *for* thet *read* that.
line 16 from bottom, *after* compass *insert* [39].
line 14 from bottom, *after* Mountains *insert* [pl. 13].
„ 31 line 18, *after* Poonah *insert* [154].
„ 37 line 17 from bottom, *after* River *insert* [21 n.12].
„ 38 line 30 *before* 286 *insert* 215.
footnote 5, *for* show *read* shows.
„ 40 line 1, *after* so *insert* [297].
line 17 from bottom, *after* Nagpur *insert* [24 n.8].
last line, *for* at *read* all.
„ 42 footnotes 10 and 11, *after* BM. *insert* Addl MSS.
„ 45 Section Heading, *after* Bengal *insert* ,1779–87.
„ 47 Section Heading, *after* Islands *insert* , 1788–96.
„ 51 line 22, *move reference number* 6 *to follow* inch, *line* 21.
„ 55 line 15 from bottom, *for* Rohilkhand *read* Rohilla.
„ 59 after footnote 1 *add* Maps, Cawnpore to Hardwār by land, MRIO. 25 (71), 30 (20, 21, 55), 31 (26, 71, 80) ; return by river, MRIO. 163 (27), 166 (24 *et seq*), 168 (2, 10–3, 15–8).
„ 67 footnote 4, John Marshall *italics*.
„ 69 Renumber references to footnotes, lines 26, 27, 28. Cabral *should read* 7, *referring to note* 8, b. 1599, etc., *which should be renumbered* 7, *date* 1614 *being changed to* 1624.
Azo *should read* 8, *referring to note* 7, Hazo, etc., *which should be renumbered* 8 *and follow the new note* 7.
Delete 8 *following* October 21st.
line 16 from bottom, *for* Ladak *read* Ladakh.
line 10 from bottom, *for* Pekin *read* Peking.
„ 70 line 10 and footnote 3, *for* Pekin *read* Peking.
„ 73 line 7, *after* Kanar *insert* [pl. 6].
footnote 4, *for* Daniel *read* Daniell.
„ 76 footnote 6, John Marshall *italics*.
„ 78 line 19, *for* Daniel *read* Daniell.
line 30 *for* tirère *read* tière.
„ 80 footnote 1, *for* ib. *read* De Filippi.
„ 82 note 3, Hobson-Jobson *italics*.
„ 83 line 12 from bottom, *delete* but otherwise all was conjecture, *and substitute* and Rennell shows a route eastward through "Munnyppur" and "Tammoo" [pl. 14].
„ 92 line 24, *after* survey *insert* [101].
„ 95 bottom line, *after* Army *insert* [279].
„ 99 note 2, *delete* Memoir 1793 (25).
„ 103 line 16, *for* Governement *read* Government.
„ 110 footnote 11, *before* 58 M/14 *insert* 2 m. N. of Cuddalore.
„ 112 line 24, *after* Ceylon *insert* [117].
„ 113 line 19, *after* Cochin *insert* [7].
„ 116 line 6, *for* Sindha *read* Sindhia.
„ 117 line 19, *after* school *insert* [286].
„ 120 line 13, *for* Herr *read* Carsten.
footnote 2, 1672–81 *italics* ; *after* (157) *insert* London 1698.
„ 123 line 10, *for* Scindhia *read* Sindhia.
footnote 8, *after* 48 P/4 *insert v.* pl. 16, C delli.
„ 124 line 13, *for* Minicoi *read* Minicoy.
„ 125 line 18 from bottom, *after* Mysore *insert* [pl. 1].
„ 126 footnotes 10, 15, *for* ib. *read* Bo S & Pol.
„ 128 footnote 1, *for* ib. *read* Bo S & Pol.
„ 149 lines 10, 17, 20 from bottom, *for* Pekin *read* Peking.
„ 159 line 19, *after* occurred *insert* [186–7].
Page 160 last line, *after* Anopshere *insert* [161].
„ 164 line 5, *for* astronnmer *read* astronomer.
line 12, *after* General Roy, *insert reference to new footnote to read*, b. 1726 ; Pr. Engr. 23–12–55 ; Lieut., 53rd Foot, 4–1–56 ; Ens. H M's. Engrs. 14–5–57 ; d. London, 1–7–90.
„ 170 footnote 6, *delete present note and substitute* Marsden, Topping, and possibly Mather, were the only sailors amongst the Madras surveyors.
„ 171 lines 16, 17, *for* Dolland *read* Dollond.
„ 173 footnote 3, *before* Acting *insert* Mad. Engrs., Ens. 17–4–70 ; *after* Mysore *insert* killed in action, Pondicherry, 1793.
„ 177 line 14, *after* Pocket *delete comma*.
„ 180 line 2, *omit* from Europe, but *and substitute* at all [pls. 2, 5, 161], or
„ 186 footnote 2, *after* (57) *insert* ; Map, MRIO. 150 (46)
line 4 from bottom, *after* usual *insert* [159].
„ 189 line 16, *for* yon *read* you.
„ 190 line 7 from bottom, *for* excuted *read* executed.
„ 194 line 7, *for* Montogomeries *read* Montgomerie.
„ 198 line 19, *after* Gunter's chain *insert reference to new footnote to read* of 22 yards, named after Edmund Gunter, and used in England from about 1620.
„ 199 note 7, 200 note 6, and p. 201 notes 1, 3, South Kensington *roman type*.
„ 201 note 4, Midnapore *italics*.
„ 208 line 11, *after* Ibn Haukal *insert reference to new footnote to read—v.* Ousely.
„ 211 footnote 2, *for* ib. *read* Herbert.
„ 215 line 5 from bottom, *after* expence *insert* [38].
„ 218 line 22, *for* 225 *read* 255.
„ 221 line 9, *for* Blaev *read* Blaeu.
„ 223 line 6 from bottom, *after* [25–6] *delete* The *and substitute* In the later edition the.
line 3 from bottom, *for* pamphlet *read* work.
footnote 10, *delete* Ben. Civ. ; *for* Consideration of Indian Affairs *read* Considerations on Indian Affairs, London, 1772.
„ 225 line 22, *for* Coas Beyhar *read* Coos Beyhar.
„ 236 line 28 and footnote 4, *for* Hemmanneau *read* Hemmonneau.
„ 240 line 3 from bottom, *for* expence *read* expense.
„ 249 note 6, Markham *italics*.
„ 253 note 1, *for* ib. *read* C D to M.
„ 260 note 1, *after* Sir *delete stop*.
„ 263 line 27, *for* Geogrpher *read* Geographer.
„ 264 line 5 from bottom, *for* at this time *read* in 1799.
„ 265 footnote 1, Supply. Desps. *italics*.
„ 271 line 15, *for* the Surveyor General *read* Call.
„ 279 line 7 from bottom, *after* Stuart *insert* [95].
„ 280 footnote 7, *after* (199) *insert* ; he was granted a further 400 pagodas a month the year before his death [392].
„ 284 lines 5 and 9 from bottom, *for* Webb *read* Webbe.
„ 285 line 4, *for* Webb *read* Webbe.
„ 286 line 1, *for* Tun- *read* Turn-
line 9 from bottom, *after* survey *insert* [160–1] ; *delete last* 5 *lines of page from* In his journal... *to* Badrinauth, etc.
„ 291 line 24, *between* this *and* wrote *insert* I.
„ 293 line 12 from bottom, *for* Mustan on hopes *read* Mustan in hopes.
„ 294 line 13, *for* carry of large *read* carry off large.
line 14, *for* attached *read* attacked.
„ 298 line 28, *after* city *insert* [299].
„ 298 line 8 from bottom, *after* God *delete stop, and for* Set *read* set.
„ 300 line 7 from bottom, *for* convenientiy *read* conveniently.
„ 302 line 7, *shift reference* 3 *to end of line* 8, *following* dismissed.

CONTINUED ON P. 305.

PREFACE

When I was at Dehra Dūn early in 1933, I received a letter from Sir Edward Tandy asking for certain particulars about Sir George Everest, and more especially what he was doing in 1833, one hundred years before, a matter of topical interest in view of the projected attempts to conquer Mount Everest by the climbers of the Ruttledge expedition and the airmen of the Houston flight.

This led to my first introduction to the old correspondence records of the Great Trigonometrical Survey, which comprise more than 700 volumes extending from about 1790 to 1883, and I found them of absorbing interest. They were in excellent preservation, and, though consisting mainly of the correspondence of the Trigonometrical Survey, include much of the Surveyor General's correspondence, particularly for those periods when the great geodesists, Everest, Waugh, and Walker, combined the offices of Surveyor General and Superintendent of Trigonometrical Surveys, viz., 1830–63 and 1875–83.

Enquiry at the Surveyor General's office at Calcutta produced similar records for the rest of the department for intervening periods, but these were in sorry state. Some volumes were missing, and all had suffered grievously from the cruel Calcutta climate ; most of them were sadly worm-eaten, and many showed signs of having been rescued from fire. Considering, however, the vicissitudes of the office during the first half of the 19th century, it is marvellous that so much survived. All honour to the hand-made paper of those early days, and the excellent writing ink. The records for the period 1863–75, when Sir Henry Thuillier was Surveyor General, are not bound up, but stored in tin boxes, each letter folded and docketed. These Calcutta records have now been brought up to Dehra Dūn, rebound, and assembled with those of the Trigonometrical Survey.

I was tremendously struck, not only with the intense interest of this old correspondence, but also with the futility of letting it continue to lie in its present inaccessible form. It had lain thus, the greater part of it, for over 100 years, and if nothing were done it would continue to lie another hundred years, if indeed it did not perish.

I saw how interesting these details of our past work would have been to me during the active years of my service ; the accounts accessible in annual reports and record volumes are mainly professional, and give no continuous narrative. Sir Clement Markham's *Memoir of the Indian Surveys* is indeed a classic summary of the work from the earliest years, but is not sufficiently intimate or detailed to grip the imagination.

To write up a history of the Survey of India from these volumes of correspondence seemed to be the best way of preserving them to posterity, and I was fortunate in finding that the Surveyor General, then Sir Harold Couchman, welcomed my offer to undertake the task after my retirement. This departmental correspondence would not however meet the whole task, for it did not cover the early years of survey, and there were many later gaps ; there was practically nothing about revenue surveys.

After a few months spent at Dehra combing through the Geodetic Branch library, I went to Calcutta where I found a wealth of material, and most generous assistance, both at the Imperial Record Office and the Imperial Library ; but the Government of India records also have been sadly depleted by accidents and fires, and hold but scanty information about the interesting period of Rennell's surveys.

During the cold weather of 1935–6 I spent six weeks at the Record Office of the Government of Bombay. There was practically nothing about Bombay surveys either at Dehra Dūn or Calcutta, but the Bombay records not only gave detailed accounts of the earliest surveys from about 1785, but also described the interesting

revenue surveys from 1830 onwards. Whilst at Bombay I was given the privilege of consulting the library of the Bombay branch of the Royal Asiatic Society, and am deeply indebted to the honorary secretary, Mr. Tilley, for access to books that I have met nowhere else in India.

From Bombay I went to Madras where I found a mass of information in the wonderful record office at Egmore, where the records are in excellent preservation and readily accessible, and the collection of valuable old maps most beautifully kept. I have specially to thank Dr. Baliga and his staff for their very courteous and valuable assistance. I also received the kindest help both at the Connemara Library, and at the library of the Madras Literary Society. At the former my most interesting find was a copy of Thomas Jefferys' *Explanation of the Map of the seat of the War on the Coast of Choromandel, 1754*; and at the latter a copy of *Rennell's Memoir of a Map of Hindoostan*, 1st edn. 1783, which the Society most graciously presented to the Survey library at Dehra Dūn.

During the cold weather of 1936–7 I spent three months at Calcutta, mostly at the Record Office of the Bengal Government Secretariat, where I found most interesting letters of the earliest surveys from 1760 onwards, both amongst the district records, and amongst those of the Territorial and Revenue departments. These included correspondence about Rennell's surveyors as well as about the revenue surveys of Bengal.

The Surveyor General's Map Record and Issue Office holds a large collection of surveyors' journals, fieldbooks, and memoirs, from which I gathered much information, and I was fortunate in obtaining the assistance of Rai Sahib A. K. Mitra, who went through the whole collection of old maps making interesting notes. It is most thrilling to go through the fieldbooks and surveys of old days, more especially when one strikes familiar country. Perhaps the most interesting finds were Cameron's survey of the 24-Parganas, 1761–2, and a portion of Anburey's fieldbook through Central India, 1792–3. This latter was sewn up with another fieldbook of an entirely different period, and bore no surveyor's name, nor year. Facing each page of traverse was a delightful water-colour painting, and it was through these that I obtained my first clue as to the surveyor, for two evenings later, whilst going through the *Calcutta Gazette* of 1793 at the Imperial Library, I found Anburey's advertisement asking for subscribers towards a "Set of Views", which closely corresponded with those of the fieldbook; further corroboration was then easy to find.

I spent from November 1937 to March 1938 in London, mostly at the India Office, where I received the utmost kindness and assistance from Mr. W. T. Ottewill, and was able to go through volumes of government proceedings of Bengal, Madras, and Bombay, many of which do not now exist in India. There were also the ecclesiastical records of births, marriages, deaths, and wills, for all Presidencies; there were the Home Miscellaneous Series, the Orme MSS., the Mackenzie MSS., Court Minutes, and many other records which do not exist in India. There were priceless rare books in the library, and the maps and manuscripts of the Map Room. Perhaps the most interesting of all these was the folio of Rennell's maps sent home in 1774, containing his account of his methods of survey and the construction of his maps, with a little index showing the area surveyed by each surveyor. This had been noted by Major Hirst in 1916 when writing up his account of the Bengal revenue surveys.

At the British Museum the library gave access to books and periodicals that could be found nowhere else; the Crown Library possessed several folios of old maps and surveys that had been sent home from India in the very early days, of many of which no copies had been kept in India. It was a great joy to show these off one morning to Colonel Ryder, Herbert Crosthwait, and Sir Harold Couchman. The Manuscript Room gave more original maps and surveys, besides surveyors' journals and private correspondence, mostly amongst the Hastings Papers. Many of these must have found their way home as private property; some may have come from the collections of Orme, Dalrymple, or Rennell.

I have also to thank the Royal Society and the Royal Astronomical Society for permission to consult books and manuscripts in their libraries.

My notes on the work of the early Jesuit missionaries have been gathered from many publications, in search for which I have received the greatest assistance from Father J. Macfarland, S.J., of St. Mary's College, Kurseong.

I wish particularly to acknowledge the kindness and the enthusiasm with which all officials at the various record offices and libraries have done everything in their power to assist my researches. I am greatly indebted to the cheerful and willing labour of the messengers at the various record offices, perhaps more especially those at the India Office, who kept me supplied with a stream of heavy volumes, often brought from subterranean vaults, to which they had to be restored in perfect order after I had done with them.

As regards the form which these Records are to take ; the Surveyor General has agreed that they should form a distinct series of volumes entitled, *The Historical Records of the Survey of India*.

There is no reason why such a series should not gradually be brought up to the present day ; I have myself aimed at the year 1883 as the limit of my own endeavour, and it is impossible to say now how many volumes this will entail. The war has now sadly interrupted not only my own work, but also the printing of this first volume, and I doubt whether I shall myself complete the narrative beyond 1862. From about 1860 regular annual reports were published ; but these are of a dry substance, and there is room for a readable human history as well.

For the period before 1860 Markham's *Memoir* is the only history of the department as a whole. For the Trigonometrical Survey there are the fascinating works of George Everest, *An account of the Measurement of an Arc of the Meridian*...1830 ; and *An account of the Measurement of two Sections of the Meridional Arc of India*... 1847 ; and also the *Parliamentary Report on Operations of the Great Trigonometrical Survey* by Sir Andrew Waugh, published in 1851 ; but these are out of print and difficult of access. There is also the series of ponderous tomes of the *Record Volumes of the G.T.S. of India*, which contain brief historical summaries of each trigonometrical series ; Sir Sidney Burrard tells me that it was General Walker who insisted on having these summaries inserted. The production of a history of the Department up to 1860, embodying the substance of the correspondence volumes to which Markham never had access, appears therefore to be a matter of urgent importance, especially when it is considered that manuscript records have a limited life.

The early story covers much more than the mere construction of rough surveys and maps that were doomed to be superceded. It tells of the constant demand of administrators for information about their own territories, and those beyond their boundaries, and at the same time their fear of spending too much money. It tells of the enthusiasm of a few for the improvement of geography and for the unravelling of the mysteries of the unknown, and also of the farsightedness of those who strove to put this survey business on to a sound footing under a professional chief with an adequate staff. Then there were the true men of science who followed the progress of instruments and methods in Europe, and brought about such achievements as an observatory for the control of astronomical observations, a school where surveyors should be taught their business, and eventually a master survey on sound geodetic principles, to which the work of all surveyors should be tied. This early history is worth telling in full, for the first efforts of the pioneers and their exploration of an unknown country can be even more interesting that the regular methodical survey of later years.

This first volume covers the 18th century, the age of romance and adventure in India, and I hope that I have succeeded in giving some sense of that romance and adventure which coloured the work of our 18th century surveyors and soldiers.

The second volume will cover a short but very important period, 1800 to 1815, during which Colin Mackenzie brought regular organization and system to the surveys of the Madras Presidency, and William Lambton laid the foundation of the trigonometrical survey and its great meridional arc.

The third volume, 1815 to 1830, will tell of the co-ordination of all the surveys under one Surveyor General of India, the extension of Lambton's survey from an affair of the South Peninsula to be the Great Trigonometrical Survey of India, and its acceptance as the one sure foundation for the geography of the continent. It will tell of the birth of a Revenue Survey Department to provide professional control for such surveys, and the start of the great Atlas of India, compiled in London, to cover the whole of India with a continuous map on a uniform scale, based on the Great Trigonometrical Survey.

I have been warned by some against making my story too full; "Don't let it run into a number of volumes that no one will ever read!"; but I am not following that advice. These records are intended first for professional surveyors now working in India, and their successors, that they may know the conditions under which the earlier surveyors worked, and how the modern system came to be built up. They will want to know all the work-a-day details, and many will be interested in the human lives of their predecessors.

These records may also prove of interest to surveyors in other countries, though there is no intention to make them in any way technical; and it is possible that men of other professions working in India, and familiar with the conditions under which such work has to be carried out, may also find passages of interest.

So far as possible, original documents have been quoted in their actual words, which give a truer picture of the actual happenings and intentions than any summary or paraphrase can do. References to published works are quoted in full as much as possible, for works of reference are not readily available in India, and it is of little use to refer the reader to a book that can only be found in London, or even in Calcutta, when he is in camp in the wilds.

A large part of this volume is taken up by biographical notes, in spite of a warning given to me that the work is always more important than the man. On the other hand, the work cannot be accomplished without the man, and it is not every man who makes a successful surveyor. It is of real interest to many of us to know something about the men who worked under the very trying conditions of those early days. It may be thought that I have told too much about their private lives, but such trifles are of interest to many; we do not know what our own lives might have been had we been working in India during the 18th century; and it is clear from their correspondence that the surveyors of those days were men of the same various types as ourselves.

These biographical notes would never have been so full as they are without the very generous assistance given by Major V. C. P. Hodson, late of Hodson's Horse, Indian Army, author of *Lives of the Officers of the Bengal Army*.

Before closing I must acknowledge the great help and encouragement I have received from Sir Harold Couchman, who has always insisted that this work was "well worth doing", and also from Sir Sidney Burrard, who has taken an intense personal interest in all my researches.

I must also thank Brigadier Sir Clinton Lewis for giving his authority for the publication to be carried through at the offices of the Geodetic Branch at Dehra Dūn; also Mr. H. H. Williams in charge of the printing office, Mr. H. J. Peychers, M.B.E. of the Photo-zinco Office, and Captain (now Lt.-Colonel) C. A. K. Wilson of the Photo-litho Office, for the efficient manner in which they have carried the work through, and their forbearance with the author.

GULMARG, KASHMIR.
OCTOBER 1939,
(DELHI, 1944).

R. H. PHILLIMORE.

Plate 3



by Gerard Mercator, 1612.

Reduced from Plate on p. 342 of *Mercator's Atlas*, Amsterdam, 1612.

Gerardus Mercator was latinized name of Gerhard Kremer (1512–94), mathematician and geographer, who devised the map projection which bears his name, and published maps of all parts of the world. [*Ency Brit.*]

Longitudes from the Pope's line [pl. 10. n.]

Notable features of this early geography are:

The river *Ganga* flowing north-east from the Deccan to an exit adjacent to the Ganges delta, first challenged by Orme, and not shown in Rennell's *Map of Hindoostan* [45, 209, 212, pls. 1, 11, 12, 13, 16].

Lake *Chiamai*, in the north-east, a fabulous source of the great rivers beyond the Ganges, and identified with the Brahmakund, reputed source of the Brahmaputra. This was first abandoned by D'Anville [78, 84, 211, pls. 11, 16].

CONTENTS

	Pages
FOREWORD	v
PREFACE	vii
CONTENTS	xi
REFERENCES OF MS. RECORDS & OTHER ABBREVIATIONS	xvi
REFERENCES TO PUBLICATIONS	xvii

CHAPTER I

GENERAL NARRATIVE

To the Departure of Rennell in 1777	1
Marātha & Mysore Wars, 1778 to 1784	3
Six Years of Peace, 1784–90	5
Extension of British Interests, 1790 to 1800	6

CHAPTER II

BENGAL SURVEYS TO 1777

Jesuit Missionaries, 1579 to 1771	10
The 24-Parganas, 1757–64	12
Coasts & Islands	13
The Great Rivers	17
Midnapore & Burdwān, 1761–6	21
Rennell & Richards, 1765–6	22
Bihār, 1766–8	24
Route Surveys	27
Rennell as Surveyor General, 1767–77	31

CHAPTER III

BENGAL SURVEYS, 1777 TO 1794

Thomas Call as Surveyor General, 1777–86	37
Goddard's March to Bombay, 1778–9	38
Pearse's Marches along the East Coast, 1781–5	40
Political Missions, 1781–90	42
Wood & Kyd, 1786–94	43
Wilford in Benares, 1788–94	43
Coasts of the Bay of Bengal, 1779–87	45
Andaman & Nicobar Islands, 1788–96	47
The Hooghly River	50
Calcutta	51

CHAPTER IV

BENGAL SURVEYS, 1793 TO 1800

Beyond the North-West Frontier	55
Chittagong Frontier, 1794	59
Chunār to Rājahmundry, 1795	59
Ganges-Hooghly River Passage, 1777–96	63
Ganges River above Cossimbāzār, 1796–1800	64
Special Surveys in Calcutta, 1795–6	65
Chittagong Coast, 1799–1800	65

Chapter V

Beyond the Barriers

	Pages
Himālaya Mountains :	
Jesuit Missionaries	67
Lama Survey of Tibet, 1712–17	70
Sources of the Ganges & Gogra	71
Bogle & Turner, 1774–84	73
Nepāl	75
The Snowy Range	76
Assam :	
The Brahmaputra	78
Welsh's Expedition, 1792–4	80
The Eastern Frontier	82
Burma	83

Chapter VI

Madras Surveys to 1788

Early Surveys to 1765	86
Barnard's Survey of the *Jāgīr*, 1767–74	88
Military Surveys in the South, 1765–75	88
Northern Circārs, 1767–76	91
Fort St. George & Madras	93
Pringle & the Guides, 1777–88	95
Kelly and other Surveyors, 1778–88	97

Chapter VII

Madras Surveys, 1786 to 1800

Coromandel Coast, 1786–93	101
Kistna–Godāvari Irrigation Surveys, 1775–98	105
Tank Repairs	107
The Corps of Guides	109
Colin Mackenzie	111
Third Mysore War, 1790–2	112
District Surveys	113
Nizām's Dominions	115
Fourth Mysore War, 1799	118

Chapter VIII

Bombay Surveys

City Surveys	120
Marātha Wars, 1774–82	121
Marine Surveys	123
Charles Reynolds, 1783–9	125
Emmitt with the Marāthas, 1790–5	128
Malabar, 1790–1800	130
Reynolds & his Map, 1792–1800	132

Chapter IX

Revenue Surveys

Methods of the Country	133
Glossary	135
Bengal	135

Chapter IX—(*concld.*)

Revenue Surveys—(*concld.*) Pages

Madras: The *Jāgīr*, 1767–91 141
Northern Circārs, 1774–88 143
Salem & Bāramahāl, 1792–9 144
Assistant Revenue Surveyors, 1795–1800 145
Bombay 147

Chapter X

Astronomical Control, Bengal

Observations before 1760 148
Rennell's Maps of Bengal, 1760–77 151
Transits of Venus, 1761–69 153
Smith, Pearse, and others, 1775–90 154
Reuben Burrow, 1783–9.. 155
Burrow's Measures of the Degree, 1790–1 164
Burrow's Last Season, 1791–2 166
Colebrooke & his Surveyors, 1794–1800 167

Chapter XI

Astronomical Control, Madras & Bombay

Madras Observations before 1786 169
Topping & the Observatory, 1786–1800 170
Military Surveys, 1788–1800 174
Bombay Observations 176
Breadth of the Peninsula 178
Fundamental Longitudes, Madras & Calcutta 180

Chapter XII

Professional Methods of Survey

Rennell in Bengal, 1764–77 182
Route Traverses 184
Madras *Jāgīr*, 1767–74 189
Michael Topping, 1788–94 190
Bāramahāl & other Madras Surveys, 1792–9 193
Madras Surveying School, 1796–1800 194
Journals and Fieldbooks 195

Chapter XIII

Survey Instruments

Chains 198
Perambulators 198
Sextants & Quadrants 199
Compasses 200
Circumferentors 201
Theodolites 201
Chronometers 202
Supply of Instruments 203
Astrolabes 206
Instrument Makers 206

Chapter XIV

Maps of India

	Pages
Ancient Geography	207
Early Maps to 1750	208
D'Anville's Map of 1752	210
Jefferys & Orme	211
Rennell's *Map of Hindoostan*, 1882–93	212
Thomas Call's Atlas, 1782–9	215
Reynolds's Map, 1793–1807	217
Colebrooke & Others	219
Postscript	220

Chapter XV

Maps of Bengal

Maps before Rennell	221
Rennell's Early Maps, 1764–72	222
Rennell's Provincial & General Maps, 1772–4	224
Bengal Atlas, 1779–83	227
Distance Tables	230
District Maps	231
Upper Provinces, 1797–1800	232
Punjab & Afghanistan, 1786–1804	232
Map Drawing & Draughtsmen	234

Chapter XVI

Maps of Madras & Bombay

Early Maps of the Carnatic, to 1780	238
Kelly's Atlas of 1782	240
Madras Maps, 1780–1800	243
Draughtsmen	244
Maps of the Nizām's Dominions	245
Maps of Bombay	245

Chapter XVII

Map Construction & Preservation

Scales	247
Projections	248
Orthography	248
Maps for Court of Directors	250
Co-operation between Presidencies	253
Custody & Distribution	256

Chapter XVIII

The Surveyor Generals

Surveyor Generals of Bengal	260
Bengal Regulations	261
Surveyor General's Office at Calcutta	262
Proposals for Surveyor General, Madras	263
Surveyor General, Bombay	265

Chapter XIX

Surveyors

Recruitment	266
Conditions of Service	266
Civil & Military Surveyors	267
Surveyors "Out of the Service"	268

Chapter XIX—(*Concld.*)

Surveyors—(*Concld.*) Pages

Rennell's Surveyors 269
Other Bengal Surveyors 270
Madras Surveyors 271
Bombay Surveyors 273

Chapter XX

Pay & Allowances

Surveyor Generals of Bengals 274
Bengal Surveyors 275
Madras Surveyors 278
Bombay Surveyor 281

Chapter XXI

Civil Establishment

European Assistants 283
Surveying School, Madras 283
Assistant Revenue Surveyors, Madras 285
Indian Explorers 286
Reynolds & his Surveyors 287
Lascars & Followers 289

Chapter XXII

Inhabitants & Officials

Bengal in Rennell's Time 291
India at Large 296
Military Escorts 300
Posts & Communications 303

Addenda & Corrigenda .. ..vi, 305
Further Abbreviations 306
Biographical Notes 308
Index.

PLATES

1. Political Map of India .. .. Front Cover
2. India to Arabia .. .. facing Title Page
3. India Orientalis .. .. ,, page x
4. Arab Map of Sind .. .. ,, ,, xx
5. On the Bhutān Border .. .. ,, ,, 23
6. The Ganges and the Gogra .. .. ,, ,, 55
7. Ladākh to Lhāsa .. .. ,, ,, 67
8. The Indus to the Ganges .. .. ,, ,, 72
9. The South Peninsula .. .. ,, ,, 86
10. After Father Monserrate .. .. ,, ,, 148
11. L'Empire du Grand Mogol .. .. ,, ,, 207
12. Presqu'Isle de l'Inde .. .. ,, plate 11
13. Bengal from D'Anville .. .. ,, page 221
14. Bengal & the Brahmaputra .. .. ,, plate 13
15. Kelly's Title-page .. .. ,, page 238
16. Terza Parte dell'Asia .. .. ,, ,, 304
17. Alexander Dalrymple .. .. ,, ,, 331
18. Robert Orme .. .. ,, ,, 332
19. James Rennell .. .. ,, ,, 377
20. Charles Reynolds .. .. ,, ,, 378
21. Index to Surveys, 18th Century .. .. .. Back Cover

References to MS. Records & other Abbreviations

B F C.	..	Bengal Foreign Consultations
B M.	..	British Museum
B M Addl MSS.		British Museum Additional Manuscripts
B Min C.	..	Minutes of the Bengal Council
B M C.	..	Bengal Military Consultations
B G O.	..	Bengal General Order
B P C.	..	Bengal Public Consultations
B Pol C.	..	Bengal Political Consultations
B R C.	..	Bengal Revenue Consultations
B Pr C.	..	Proceedings of Council, Bengal
B S C.	..	Bengal Secret Consultations
B S C C.	..	Bengal Select Committee Consultations
B S & F.	..	Bengal Secret & Foreign Consultations
B S & Pol.	..	Bengal Secret & Political Consultations
B S & M.	..	Bengal Secret & Military Consultations
B S & Sep.	..	Bengal Secret and Separate Correspondence
B Ter C.	..	Bengal Territorial Consultations
B to C D.	..	Bengal Letter to Court of Directors
B Rev Bd.	..	Bengal Board of Revenue
B Ter Rev.	..	Bengal Territorial Revenue Proceedings
Ben.	..	Bengal
Bo F & P.	..	Bombay Foreign & Political
Bo M C.	..	Bombay Military Consultations
Bo M E.	..	Bombay Military Establishments
Bo P C.	..	Bombay Public Consultations
Bo Pol C.	..	Bombay Political Consultations
Bo R C.	..	Bombay Revenue Consultations
Bo S & Pol.	..	Bombay Secret & Political Consultations
Bo Sur.	..	Bombay Survey Correspondence
Bo to C D.	..	Bombay Letter to Court of Directors
Bom.	..	Bombay
C-in-C.	..	Commander-in-Chief
C Cor.	..	Committee of Correspondence, I O.
C D.	..	Court of Directors
C D to B.	..	Court Despatch to Bengal
C D to Bo.	..	Court Despatch to Bombay
C D to M.	..	Court Despatch to Madras
C E.	..	Chief Engineer
C M.	..	Court Minutes, I O.
Cat.	..	Catalogue
cf.	..	Compare
Ch & C.	..	Chief & Council
Com of Rev.		Committee of Revenue
D Dn.	..	Survey of India Records at Dehra Dun
deg.	..	Degree
Desp.	..	Despatch
E.	..	East
E I C.	..	East India Company
Emb Lists	..	Embarkation Lists, I O.
et seq.	..	and following
Exbt.	..	Exhibit
Fdbk.	..	Fieldbook
G B O Lib.	..	Library of Geodetic Branch Office, Survey of India, Dehra Dun
G in C.	..	Governor in Council
G G in C.	..	Governor General in Council
G O.	..	General Order
Govt.	..	Government
H C. Report	..	House of Commons Reports ; Committees 1831–32. Vol. IX (P R O.)
H M S.	..	Home Miscellaneous Series, I O.
I O Copies	..	Bound Copies of I O. Records with Imperial Records, New Delhi
I O Lib.	..	India Office Library
I O Misc.	..	India Office Miscellanies
I O Maps	..	India Office Map Room
I R D Lib.	..	Imperial Record Department Library, New Delhi
ib.	..	The same ; as above
Imp Lib.	..	Imperial Library, Calcutta
[*inf*]	..	below
Kelly's Atlas.		Manuscript Atlas in two volumes at S G O. Library, Calcutta
M A G.	..	Military Accountant General
M G C.	..	Madras General Consultations
M M C.	..	Madras Military Consultations
M P C.	..	Madras Public Consultations
M R C.	..	Madras Revenue Consultations
M R I O.	..	Map Record & Issue Office, Calcutta
M R O.	..	Madras Record Office, Egmore
M Rev Bd.	..	Madras Board of Revenue Proceedings
M S C.	..	Madras Secret Consultations
M S C C.	..	Madras Secret Committee Consultations
M S & M.	..	Madras Secret & Military Consultations
M S M & P.	..	Madras Secret Military & Political Consultations
M S & Pol.	..	Madras Secret & Political Consultations
M Sel. C	..	Madras Select Committee Consultations
M to C D.	..	Madras Letter to Court of Directors
Mack MSS.	..	Mackenzie Manuscripts, I O.
Mad.	..	Madras
Mad Civ Ests.		Madras Civil Establishments, I O.
Mad Eccl.	..	Madras Ecclesiastical Records, I O.
Mar Rec.	..	Marine Records, I O.
Mil Bd.	..	Military Board
Misc.	..	Miscellaneous
Misc L R.	..	Miscellaneous Letters Received, I O.
Min.	..	Minute of Correspondence or Angle
N.	..	North
n.	..	Footnote
Orme MSS.	..	Orme Manuscripts, I O.
P C R.	..	Provincial Council of Revenue, Bengal
P R O.	..	Public Record Office, London
p.	..	Page
passim	..	here and there
Pers Rec.	..	Personal Records, I O.
Q M G.	..	Quartermaster General
[qv]	..	which/whom, see
R S Lib.	..	Royal Society Library
Rev.	..	Revenue
S.	..	South
S G.	..	Surveyor General
S G O.	..	Surveyor General's Office
Sec.	..	Secretary
Sel.	..	Select
Sep.	..	Separate
sv.	..	sub verbo (under the head)
[*sic*]	..	thus, as printed
[*sup*]	..	above
V M.	..	Victoria Memorial Hall, Calcutta
v.	..	see
W.	..	West

Dates : 22nd August 1758 or 22–8–58. Reference to page/plate of this volume : [286]/[pl. ...].
Number of page, folio, consultation or paragraph : (286). Editorial insertions : [...].
References to maps of the Survey of India : 72 L/12 [Key, pl. 21].

FURTHER ABBREVIATIONS : P. 306.

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Aitchison	*A Collection of Treaties*...C. V. Aitchison. 1909.
Antiquité Géographique	*Antiquité Géographique de l'Inde et plusieurs autres contrées de la Haut Asie.* Bourgignon d'Anville. 1775.
Arbuthnot	*Major-General Sir Thomas Munro*... Arbuthnot. 2 vols. London. 1881.
As A R.	*Asiatic Annual Register* (periodical).
As J.	*Asiatic Journal* (periodical).
As R.	*Asiatic Researches* (periodical).
Aspinall	*Lord Cornwallis in Bengal.* Aspinall. 1931.
Ball	*Travels in India.* Jean-Baptiste Tavernier. ed. by Ball. 2 vols. 1889.
Beatson	*The Origin & Conduct of the War with Tippoo Sultaun.* Alexander Beatson. 1800.
Beloved Marian	*Beloved Marian.* K.L. Murray. London. 1938.
Ben Atlas	*A Map of Bengal & Bahar in VIII parts*... James Rennell. 1779.
	A Bengal Atlas...2nd edn. of above. J. Rennell. 1781. 3rd edn. 1783. Reprinted S G O. Calcutta. 1914.
Ben P & P.	*Bengal Past & Present* (periodical).
Ben Sel.	*Selections from the Records of the Government of Bengal* (occasional).
Bernoulli	*Description Historique et Géographique de l'Inde.* Jean Bernoulli. Berlin 1786–9. 3 vols. German edn. 1786. 3 vols.
Bessé	*Missionaries du Carnatic de la Compagnie de Jésus.* L. Bessé. S.J. Trichinopoly. 1918.
Besson	*Les Aventuriers Français aux Indes, (1775–1820).* Maurice Besson. Paris. 1932.
Bion	*Construction & Principles of Mathematical Instruments.* Bion. 1723. Translated from the French by Stone.
Blakiston	*Twelve Years of Military Adventure in three quarters of the Globe.* John Blackiston. 1829. 2 vols.
Blechynden	*Calcutta Past & Present.* Kathleen Blechynden. London. 1905.
Blochman	*Ain-i-Akbari*, by Abul-Fazl. Translated by H. Blochman. vol. I. 1871.
Blunt	*Christian Tombs & Monuments in the U.P.* Blunt. 1911.
Bo Geo Soc.	*Transactions of the Bombay Geographical Society* (periodical).
Bowring	*Haidar Ali and Tipu Sultan.* L. B. Bowring. 1893.
Bradshaw	*Life of Thomas Munro.*
Broadway Travellers	*Voyages and Travels of Mandelsloe.* Henry Dodwell. The Broadway Travellers. (1930 ?).
Broome	*Rise and Progress of the Bengal Army.* Broome. 1850.
Brucker	*Catholic Encyclopœdia.* New York. 1911. Paper by Joseph Brucker. S J., of Paris.
Buchanan	*A Journey from Madras through the Countries of Mysore, Canara and Malabar.* Francis Buchanan. 1807. 3 vols.
Buckle	*Memoirs of the Services of the Bengal Artillery.* E. Buckle. 1852.
Bunbury	*History of Ancient Geography.* Sir E. Bunbury.
Busteed	*Echoes from Old Calcutta.* Busteed. 1908.
C C Rev.	*Proceedings of the Controlling Council of Revenue at Murshidabad.* 2 vols. Calcutta. 1920.
C G.	*Calcutta Gazette* (periodical).
Cadell	*History of the Bombay Army.* Patrick Cadell. 1938.
Calcutta O & N.	*Calcutta Old and New.* Evan Cotton. 1907.
Cambridge	*An Account of the War in India between the English and the French on the Coast of Choromandel...from 1750 to 1760.* R. O. Cambridge. London. 1761.
Campos	*History of the Portuguese in India.* J.J.A. Campos. Calcutta. 1919.
Caraccioli	*Life of Robert Lord Clive, Baron Plassey.* Charles Caraccioli. London. undated [1775–7]. 4 vols.
Cardew	*Services of the Bengal Native Army.* Cardew. Calcutta. 1903.
Carey	*The Good old days of Honorable John Company, 1600–1858.* W. H. Carey. Simla. 1882. 3 vols.
Carmichael	*Manual of the District of Vizagapatam.* D. F. Carmichael. Madras. 1869.
Carroll's Code	*Abstract of General Orders & Regulations ...on the Bengal Establishment.* 1812.
Century Series	The Century Science Series. *Major James Rennell.* ... Clements Markham. 1895.
Clan Campbell	*Records of Clan Campbell in H.I.E.C.* 1925.
Clements Markham	*Narrative of the Mission of George Bogle of Tibet.* Clements Markham. London. 1879. *v.* Markham.
Close	*The Early Years of the Ordnance Survey.* C. F. Close. 1926.
Colebrooke	*Life of Mountstuart Elphinstone.* Colebrooke. 1884. *v.* T. E. Colebrooke.
Colin Mackenzie	*Dominions of the late Tippoo Sultan.* Colin Mackenzie [not the S G.]. Calcutta. 1854.
Commentarius	Father Anthony Monserrate's *Mongolicæ Legationis Commentarius.* Ed. H. Hosten. S.J. *Memoirs of As. Soc. of Bengal* III. No. 9. (515–704). 1914.
Companion Atlas	*A Companion Atlas to those published by Major James Rennell.* ... Illustrated by a Memoir by Hirst & Ascoli [qv]. 1914.
Cotton	*List of Inscriptions on Tombs in Madras.* Cotton. 1905.
Cox & Stuart	*District Manual, North Arcot.* Cox, revised by Stuart. Madras.
Crawford	*History of the Indian Medical Service.* D. G. Crawford. 2 vols. London. 1914.
Crawford's *List*	*List of Officers of the I.M.S.* D. G. Crawford. London. 1930.
Crawfurd	*Journal of an Embassy to the Court of Ava, 1827.* John Crawfurd. London. 1829.
Cyc. Ind.	*The Cyclopœdia of India.* Calcutta. 1909.
D I B.	*Dictionary of Indian Biography.* Buckland.
D N B.	*Dictionary of National Biography.*
Dalby	*A Short Account of...Burrow's measurement of a Degree* ... Isaac Dalby. London. 1796. MS. in R S. Lib.
Dalrymple	*Nautical Reports.* Alexander Dalrymple. B M. *Papers on Eastern Navigation.* I O 1770–87. *v. Oriental Repertory.*
D'Anville	*Éclaircissemens Géographiques sur la Carte de l'Inde.* Paris. Bourguignon d'Anville. 1753. English translation, *v.* Herbert; *Antiquité Géographique.*

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Davis	*Vizier Ali Khan, or The Massacre at Benares.* James Davis. 1st edn. 1844. 2nd edn. 1871.
De Filippi	*Desideri. An Account of Tibet.* De Filippi. 1932.
Dict. Générale	*Dictionnaire Générale de Biographie et d'Histoire.* Dezobry et Bachelet.
Dict. Suisse	*Dictionnaire historique et biographique de la Suisse.*
Dirom	*A Narrative of the Campaign in India with Tippoo Sultan, 1792.* Dirom. 1793.
Dist. R.	*Bengal District Records.* Rev. W. K. Firminger. 1914. *Sylhet.* 4 vols.; *Rungpur* 4 vols.; *Midnapore* 4 vols.; *Dinajpur*; *Chittagong* (not by Firminger).
Dodwell	*The Nabobs of Madras.* H. Dodwell. London. 1926. *v.* Henry Dodwell; Broadway Travellers.
Douglas	*Bombay & Western India.* Douglas. 1893.
Du Halde	*Description del' Empire de Chine.* Father du Halde. Paris. 1735. 4 vols.; English edn. incl. maps, 3 vols. 1738.
E I M C.	*East India Military Calendar.* John Philippart. 1823–6. 3 vols.
Edwardes	*The Rise of Bombay.* Edwardes. 1902.
Elliot	*The History of India by its own Historians.* H. M. Elliot & Dowson. 1867–77.
Ency. Brit.	*Encyclopædia Britannica.* 11th edn. 1915; 14th edn. 1929.
Eur. Mag.	*European Magazine* (periodical)
Everest	*A Series of Letters addressed to H.R.H. the Duke of Sussex.* George Everest. 1839.
F. C. Hirst	*Old Revenue Surveys of Bengal, Bihar, Orissa, and Assam.* F. C. Hirst. Calcutta. 1912. *v.* Hirst.
F D Sel.	*Selections from the records of the Government of India, Foreign Department.*
Fay	*Original Letters from India.* Mrs. Fay. 1817.
Firminger	*Proceedings of the Comptrolling Committee of Revenue; Murshidabad.* Rev. W. K. Firminger. *v. Dist. R.*
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Forster	*A Journey from Bengal to England. ...* George Forster. London 2 vols. 1790. Reprinted, Allahabad, 1915.
Foster	*A Guide to India Office Records.* William Foster. 1919. *v.* William Foster.
Francis	*The Francis Letters.* Francis & Keary. (1902 ?). 2 vols.
Francklin	*History of the Reign of Shah-Aulum.* W. Francklin. 1798.
Fullarton	*View of the English Interests in India...* Col. Wm. Fullarton. 1788.
Gaz. Bombay City	*The Gazetteer of Bombay City and Island.* S. M. Edwardes. Bombay. 1909.
Geo. Rev.	*Geographical Review* (periodical).
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Ghosh	*Sannyasi & Fakir Raiders in Bengal.* Ghosh. Calcutta. 1930.
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Gleanings in Science.	(periodical). Calcutta. 1829–33.
Gleig	*Life of Sir Thomas Munro.* Gleig. 2 vols. 1830.
Govt. Gaz.	*Government Gazette* (periodical). Calcutta.
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Greene	*Code of the Pay Regulations, Ft. William, with Staff Tables.* W. S. Greene. Kidderpore. 1803.
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Hunter	*The Thackerays in India...* W. W. Hunter. 1897. *v. Rural Bengal.*
Hyde	*Parochial Annals of Bengal.* H. B. Hyde. Calcutta. 1907–9.
Imp Gaz.	*Imperial Gazetteer of India.* Calcutta. 1907–9.
Imp Lib M & P.	*Catalogue of Maps & Plans in the Imperial Library.* Calcutta. 1910.
Innes	*History of the Bengal European Regiment.* Innes. 1885.
I O Cat.	*Catalogue...of MS. & Printed Reports, Memoirs, & Maps of the Indian Surveys...at the India Office.* Markham 1878.
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Ives	*A Voyage from England to India in 1754.* Edward Ives. 1773.
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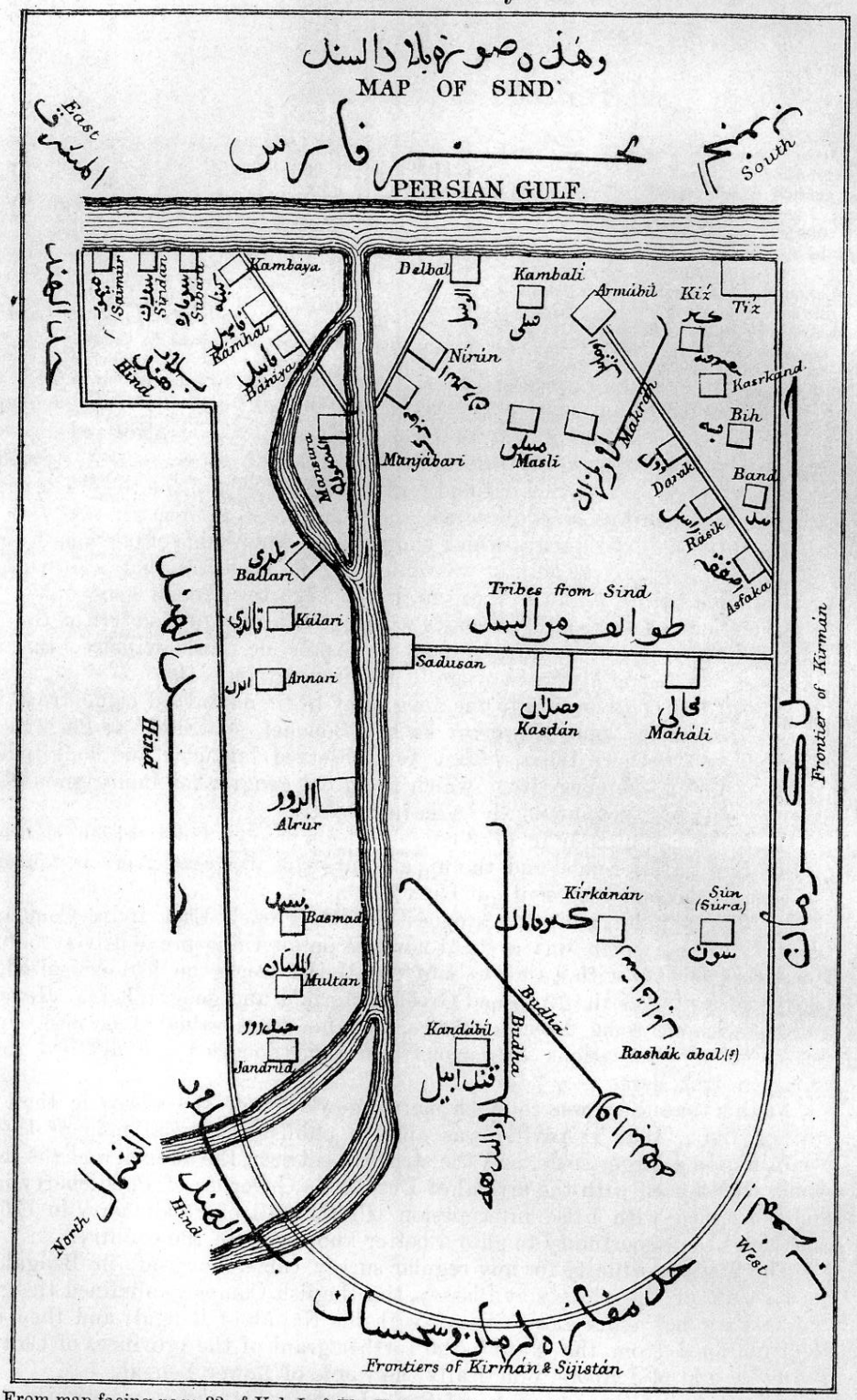
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Plate 4

ARAB MAP OF SIND

11th Century



From map facing page 32 of Vol. I of *The History of India by its own Historians.* Elliot & Dowson. Pub. Trubner & Co. London. 1867.

A reproduction, with the addition of the English translation of the Persian script, from a map contained in the *Ashkāl-ul-Bilād* of Ibn Haukal [208].

The real name of Ibn Haukal was Muhammad Abū-l-Qāsim, a native of Baghdād, who left Baghdād on his travels in 943, A.D.

The following extracts illustrate his description of Sind, and are typical of the information on which D'Anville constructed his map of 1752.

The Mihran is the chief river of those parts. sea in the neighbourhood of Multan. It then flows by Basmad, Alruz, and Mansura, and falls into the sea, to the east of Debal.... It inundates the land during the summer rains, and on its subsidence the seed is sown, as in Egypt.

From Mansura to Debal is six days journey; from Mansura to Multan, twelve; from Mansura to Turan, about fifteen: from Kasdar, the chief city of Turan, to Multan, twenty. ...

He who travels from Mansura to Budha must go along the banks of the Mihran, as far as the city of Sadustan.

Ibn Haukal's work gives the geography of all countries of Islam, and his description

CHAPTER I

GENERAL NARRATIVE

To the Departure of Rennell in 1777 — Marātha & Mysore Wars, 1778 to 1784 — Six Years of Peace, 1784–90 — Extension of British Interests, 1790 to 1800.

Up to the 18th century there was little real knowledge of the geography of India; the many maps that had been published in Venice, Holland, France, and England, were based on tradition and on tales of mariners and travellers; in the absence of more sure foundation they borrowed the one from the other, acquiring variation and detail as fancy directed.

Here and there were maps which showed some knowledge of portions of the coast and its neighbourhood, and it was chiefly from mariners that information of a more reliable nature began to creep in, till in 1723 the French geographer Delisle published maps of the southern coasts which gave a very fair picture of the general outline. These were improved upon by Après de Mannevillette, the French navigator, who made his first voyage to Pondicherry in 1719.

The earliest contribution to the geography of the mainland came from French Jesuit missionaries, one of whom, Father Bouchet, sent home to Paris in 1719 a rough map of southern India, with a few observed latitudes and longitudes, and several detailed sketches, from which the great geographer Bourgignon d'Anville published his first map of South India in 1737.

D'Anville had already in 1733 completed his map of Tibet, which showed part of the Himālayan range and the upper courses of its great rivers as conceived by the Lamas who had been sent out from Pekin [pl. 7].

In 1752 he published, at the request of the French East India Company, his *Carte de l'Inde*, which was a great advance on anything previously accomplished. He accompanied it with a full account of all the works he had consulted, going back even as far as the Arab and Greek historians and geographers. He accepted nothing without some direct evidence, and his most valuable material included astronomical observations by various Jesuit missionaries and detailed routes of European travellers.

At this time there was so much more knowledge of the Carnatic than of the rest of India, that D'Anville was able to publish a special map of the South Peninsula on a larger scale, and the struggle between the French and the English, which had started with the arrival of Dupleix as Governor of Pondicherry in 1749, and continued with little intermission till the fall of Pondicherry in 1761, gave both sides the opportunity to gain a better knowledge of the country.

The first opportunity for any regular survey came, however, in Bengal, where as a result of the victory at Plassey, the English Company obtained the grant of the 24-Parganas and a close alliance with the Nawāb of Bengal; and then in 1760 they obtained from the Nawāb the further grant of the provinces of Chittagong, Burdwān, and Midnapore, practically the whole of Lower Bengal.

Knowledge of the geography of Bengal was at this period practically confined to the banks of the Ganges and Hooghly rivers, as depicted on the extract of D'Anville's *Carte de l'Inde* given on plate 13.

Surveys of the new possessions were ordered by the local Council, and encouraged from London. The first thought was to ascertain the extent of cultivated lands and the value of their revenues; then there was the safety and regularity of communication, both by sea and through the rivers; and then the defence of the passes of the western frontiers.

Plaisted was put on to survey the coasts of Chittagong and the Sundarbans, and Hugh Cameron to survey "the New Lands" of the 24-Parganas. On Cameron's death in 1764, James Rennell was appointed surveyor in his place, but deputed to survey the Ganges River and search for a waterway for up-country traffic from Calcutta that should be navigable throughout the year.

Early in 1765 De Gloss was appointed to survey the Burdwān district, and then, as the defence of the western passes became an urgent matter, one surveyor after another was appointed, either by the Council at Fort William, or by the commander of the forces on the frontier.

In 1765 Clive returned to Bengal for his second term of office, and, having been specially asked by Robert Orme, the historian, to make him "a vast map of Bengal", commissioned Rennell to carry out this task.

Rennell set about his work with so much enthusiasm and ability, showing a positive genius for putting maps together, that Clive and his Council made him Surveyor General from the beginning of 1767, and placed all available surveyors under his orders. Some of these were engineer officers, and a few were infantry officers, who had a taste for the work; amongst the latter was the Frenchman Claud Martin, who became famous in after years as the founder of the "La Martiniere" schools.

The necessity for a proper marine survey of the coasts and islands was not overlooked, and Ritchie was appointed marine surveyor after Plaisted's death, and made a complete survey of the coasts from the south of Chittagong, round and through the Sundarbans, and down the east coast as far as Madras, besides a general survey of the Andaman and Nicobar Islands.

By 1773 Rennell and his surveyors had completed the survey of the Company's possessions in Bengal and Bihār which by now extended to the frontiers of Oudh and Allahābād on the west, and to the southern jungles of Chota Nāgpur and the forests of Orissa on the south. To the north-east Rennell had himself surveyed the Brahmaputra River as far as the Assam frontier near Goālpāra in 1765, and the survey now extended to the foot of the Garo and Khasia Hills and embraced the whole of Sylhet and Chittagong.

Early in 1774 he submitted to Government a complete set of provincial maps on the scale of 5 miles to an inch, together with general maps on smaller scales, and shortly afterwards Government called in all surveyors, including some who had been at work in Oudh under Polier. Rennell stayed on at Dacca, improving his maps with such extra material as he could collect, and at the end of 1776 obtained permission to send out surveyors to fill up small gaps near Cooch Behār, the Santāl country, and Palāmau, and to extend surveys through Allahābad and Oudh.

He now considered that his task was complete; he had been seriously wounded during an encounter with *fakīr* marauders in 1766, and his health had suffered greatly during his arduous years in the vile climate of Eastern Bengal; as soon as he was assured of a pension he resigned the service, and left India early in April 1777. He continued to serve the cause of India and geography till his death.

There were occasional surveys undertaken beyond Rennell's control, the most notable of which was the survey of Colonel Upton's route to Poona in 1775, which was entrusted to the Rev. Willliam Smith, a gentleman of whom little else is known. With astronomical observations taken almost every night, his survey across the unknown heart of India was hailed by Rennell and other geographers as a most valuable contribution to geography.

Thanks to the strong start given to him by Clive, and also to his own clear view of what could be done with the available men, instruments, and time, Rennell succeeded in giving Bengal and Bihār, inside the comparatively short period of 12 years, a continuous and uniform set of maps. The survey was far from complete or accurate in detail, but showed the general geography of the whole country and the more important features with sufficient accuracy for the needs of the time.

Nothing like this was attempted elsewhere in India, although more than one surveyor would have been ready to undertake the task. In Bengal alone was the political situation favourable.

Under the Madras Presidency considerable information had been collected of Trichinopoly, Tinnivelly, and Madura, by the survey of military routes under the direction of the Chief Engineer, John Call, and a general map of the South Peninsula had been compiled by Henry Montresor, but the only lands belonging to the Company were the *Jāgīr*, granted in 1763, and the Circārs to the north of the Kistna River, which were occupied in 1768.

The *Jāgīr* was a thickly populated and rich tract about 100 miles by 50 in extent, and Barnard's survey, begun in 1767, was a model of what a survey should be. It was carried out on a scale of 2 inches to a mile on strict scientific principles, and, besides shewing all topographical features, gave a wealth of information for revenue purposes: the maps were not completed till 1774.

The survey of the Circārs was a different matter; the country was extensive, and the greater part of it was covered with jungle and most unhealthy. In the first years after it had been taken over, a start was made at the two extremes. To the north, in Ganjam, Cotsford, the civil officer in charge, produced an "elegant map" in addition to his other multifarious duties. To the south, in Masulipatam, Stevens of the Engineers did his best to meet the urgent wish of the local council for a more accurate knowledge of the country; but here again survey could only be undertaken when time was stolen from other duties.

In 1773 a serious effort was made to complete the survey, and the Chief Engineer appointed Stevens to survey the southern area, and Pittman and Johnston, also of the Engineers, to survey from the north. But the work was never brought to completion; military duties to the south called away first Stevens, and then his relief, Dugood; the climate killed Pittman within two years and Johnston's health suffered so much that he had to be recalled at the end of 1776.

Between 1770 and 1775 several attempts were made to persuade the Nawāb of the Carnatic to allow a general survey to be carried out over the whole of his dominions. The Nawāb and the English had now been firm allies for many years; it was pointed out to him that an accurate survey of his dominions would greatly facilitate the operations of the English armies in his service, but he was uncompromising in his objections, the chief of which was his fear that it would "cause a diminuation of his Dignity and Honour in the eyes of the Neighbouring Powers and Foreigners". So the matter was dropped, and the soldiers continued to grope their way about the country as best they could, with such help as they get from the surveys of their former marches, which continued to be extended by a few ardent surveyors like Robert Kelly.

There is little as yet to tell of Bombay; the Company possessed no lands beyond the island of Bombay except the factories at Surat and along the Malabar coast, until at the end of 1772 they captured the town and *pargana* of Broach, and in 1774 occupied the island of Salsette. As early as 1756 officers of the Artillery Company had made detailed surveys of the town and fortifications, both at Bombay and Surat, and, during the campaign of 1775 against the Marāthas, survey was made of the marches of the army into Gujarāt and a start made on the survey of Broach *pargana*.

MARĀTHA & MYSORE WARS, 1778 TO 1784

After Rennell left India the need for surveys in Bengal seemed satisfied, and Thomas Call, the new Surveyor General, settled down to the compilation of an atlas that should embrace the whole of India.

In Madras Kelly pursued his self-imposed task of covering the south peninsula with an atlas of degree sheets compiled from measured routes, but his proposal for a regular survey department was turned down.

Another Madras soldier, John Pringle, took up the survey of routes with great enthusiam, and on his initiative a military Corps of Guides was established, whose officers and men contributed largely to the surveys of the presidency for the next thirty years.

And now Bombay comes well into the picture. In 1778 war broke out once more against the Marāthas, and the Governor General, much against the wishes of his Council, sent a strong force of Bengal troops to march right across India to support the Bombay Government. After many delays this force reached Surat under General Goddard at the end of February 1779, and in the three years war that followed, Goddard's army overran the country below the Ghāts north of Bombay, and occupied the greater part of Gujarāt.

The route of the force from Kālpi to Surat had been most carefully surveyed by Arthur Caldwell and Duncan Stewart, and was a most valuable tie line for the geography of the continent. Stewart continued as surveyor to the force till he died just as the Bengal detachment reached the Narbada on its march homewards in 1784. Other officers, principally Charles Turner and Reynolds did good work in clearing up the geography of these regions, besides completing the survey of Broach *pargana*.

Peace was concluded with the Marāthas in 1782, and a Bombay force was sent to the west coast to co-operate against Haidar Ali; Reynolds accompanied this with the surprising post of Surveyor General to the army, which he justified by making an excellent map of the completely unknown country between Bednur and the coast, about latitude 14°.

And now to return to Madras, where Haidar Ali of Mysore had threatened the very existence of the settlement by invading the Carnatic in force in July 1780, and completely annihilating Colonel Baillie's column and driving Hector Munro's small army back on Madras. Reinforcements were hastily sent from Bengal, the most important of which was General Sir Eyre Coote to take command in person. A strong detachment of infantry was marched down the east coast under the command of Colonel Pearse, of the Bengal Artillery, and early in 1783, after the death of both Coote and Haidar Ali, the English armies had definitely won the day. Another year's fighting remained before Tipu could be brought to terms, and peace was not signed till March 1784.

During this war several notable additions were made to the geography of India. The most important was the surveyed line run between Madras and Bengal on the return of Pearse's force in 1784. Pearse himself was an enthusiastic astronomer, and it was under his personal direction that, on this march, a young infantry officer, Robert Colebrooke, ran a continuous perambulator traverse, and took a regular series of astronomical observations for latitude and longitude.

Another valuable line was surveyed by Robert Kelly and other surveyors with Colonel Fullarton's army, which marched in 1783 from Negapatam on the east coast, through Madura to Palghāt, and there connected with a survey brought up from the Malabar coast the previous year by Colonel Humberstone's detachment.

Throughout the war John Pringle did yeoman service as Captain of the Guides, and his route surveys were of the greatest service to General Coote.

Yet another important link was the connection of Nāgpur by the surveys of James Ewart, who accompanied the mission sent by the Governor General to the Rāja of Berār, to secure his friendship during the struggle against Haidar Ali.

Rennell's first *Map of Hindoostan* reached India in 1783, too late to be of use whilst the wars against the Marāthas and Mysore were in progress; indeed, this first map would have provided little information of value, for it was not until Rennell had embodied all the geographical results of these wars into a new map on a larger scale that it became a standard authority.

In compiling his great map Rennell followed D'Anville's method of a close analysis of all the early historical and geographical evidence available, and he had a wealth of additional material collected by the surveys of the last 25 years. In

his later editions he was able to include the work of the Jesuit geographer, Father Tieffenthaler, who had been making measurements and observations from Bombay to the foot of the Himālaya Mountains for nearly 30 years.

The scattered geographical material now available was not easy to compile; serious discrepancies were inevitable when using long lines winding through hills and jungles, with distances but roughly measured, or merely estimated; latitude observations gave valuable checks when available, but observations for longitude were often more uncertain than the measured routes.

The skill with which Rennell put this material together, and the account which he gave of it, won him far greater renown than did his survey of Bengal.

SIX YEARS OF PEACE, 1784–90

The continuous wars of the last few years had greatly impoverished the East India Company, and a period of rigid economy was the natural consequence. In Bengal drastic reductions were made in all establishments and salaries, and early in 1785 surveyors were called in, not, however, before an elaborate survey of Calcutta had been completed by several Engineer officers under Mark Wood.

The attention of the Directors to the cause of geography had, however, been particularly stimulated by recent events, and to assist their geographers, Dalrymple and Rennell, the Court called on each of the Presidencies to send home copies of all surveys that could be collected; they also asked for an accurate chart of the Coromandel coast, which Ritchie had not been able to complete. The work of the Surveyor General's office at Calcutta was thus concentrated on the copying of maps, whilst Thomas Call made special efforts to complete his Atlas of India.

Finding great discrepancies in the geographical positions adopted for many important places, Call suggested that a special astronomical survey should be carried out by Reuben Burrow, an eminent mathematician who had come out to Calcutta in 1783, and Burrow spent two seasons, 1787–9, travelling from one end of the Presidency to another, fixing a number of places by astronomical observation. These positions were accepted as authoritative for the next thirty or forty years, though here and there they were found to be disputable.

Burrow spent another two seasons in attempts to measure the length of a degree, both of latitude and longitude, a work that had been suggested by General Roy, the great English geodesist, but he died in 1792 before he could bring his work to a satisfactory conclusion.

At this period there was a call for better harbour accommodation for the Company's shipping, such being practically non-existent along the east coast of India. In 1787 Alexander Kyd was sent to survey the island and harbour of Penang, or Prince of Wales Island, which had been ceded to the Company the previous year.

In the following year Archibald Blair, of the Bombay Marine, was deputed to survey the Andaman Islands, with the particular object of finding a good harbour, and in 1789 Kyd and Colebrooke accompanied Commodore Cornwallis, of the Royal Navy, on a further reconnaissance round the Andaman and Nicobar Islands, making special surveys of all the likely harbours, including that of Nancowry.

Blair completed his survey and remained at the Andamans till the end of 1792, when he was relieved by Kyd, who was occupied with the defences of the settlement until 1796, when it was decided to rely solely on the harbour at Penang.

For some time the Madras Government were unable to find a suitable officer for the survey of the Coromandel coast, which the Directors considered particularly urgent, owing to the number of ships which had been lost along its open shores, which were moreover obstructed in places by dangerous shoals.

In 1787 they found a marine officer of experience and ability, named Michael Topping, who, breaking away from the eternal method of perambulator traverse,

ran a 300-mile line of triangles along the coast from Madras to Palk Strait. He was then deputed to survey and report on the value of Coringa Bay as a possible port of shelter.

Topping was a skilled astronomical observer, and as such realised that astronomical observations for longitude were of little value unless compared against corresponding observations made at one or more stations of known longitude. He obtained the use of a private observatory at Madras for this purpose, and also the services of John Goldingham as his astronomical assistant. He then obtained sanction for the erection of a permanent observatory, which was completed and taken into use in 1793.

Further progress was made in filling up the "military geography" of the southern peninsula by the efforts of the officers of the Corps of Guides; and after Pringle's death, the work was carried on with zeal by Beatson and Allan.

On the occupation of Guntūr Circār by the company's troops in 1788, a survey of its roads and passes was made by a young Engineer officer named Colin Mackenzie.

Turning once more to Bombay, we find that early in 1785 Reynolds was called upon to accompany a political mission, which travelled through the heart of the unknown plateau of Mālwa, to seek out the Marātha chief, Mahadji Sindhia. The mission started from Surat and passing through Ujjain and Gwalior, found Sindhia near Muttra; after a visit to Delhi the party continued its march to Cawnpore, where boats were taken down the river to Calcutta.

This gave Reynolds a wonderful line to survey, and he was delighted to find that it completely changed the face of the country as depicted on Rennell's first *Map of Hindoostan*. It is interesting to note the natural triumph of every surveyor who is able to correct by actual survey the map of some earlier worker who never had his opportunities!

The mission returned to Bombay by sea, and Reynolds was then sent up to the Deccan with the Resident to the Peshwa's court at Poona. At the special request of the Governor General he was directed to make such surveys as he could, without offending the Marāthas.

During the next three years he travelled backwards and forwards across the Deccan, and made several journeys by different routes between Poona and Surat. During season 1788–89 he travelled from Nāgpur to Hyderābād, then through Masulipatam to Madras, returning again through Hyderābād.

Throughout his journeys he did his best to prevent his surveys being noticed and talked about, lest the Marāthas should become jealous of his activities, but eventually, in 1789, the Governor General being particularly anxious to avoid giving offence to the Peshwa in view of approaching trouble with Mysore, Reynolds was directed to abandon further field work and to remain at Surat working up his maps.

Surveys of the west coast had been carried out by officers of the Bombay Marine and other sailors. Huddart had fixed a series of longitudes along the coast southwards from Bombay by means of chronometers, and between 1787 and 1790 McCluer surveyed the coast from Kāthiāwār to Cape Comorin, though he had to leave a considerable stretch uncharted because of the hostility of Tipu's officers.

EXTENSION OF BRITISH INTERESTS, 1790 TO 1800

In 1790 war broke out once more against Tipu and, during an inconclusive campaign along the southern borders of Mysore, Allan and Mackenzie were able to survey many miles of new routes.

To hasten a conclusion, the Governor General, Lord Cornwallis, decided to take command in the field himself, and left Calcutta in December 1790. He appointed the Surveyor General, Kyd, to his personal staff, and the assistants in the Surveyor General's office also took the field. To Colebrooke was assigned the task of keeping

up a survey of the routes of the Grand Army, and by the time the treaty was signed before Seringapatam in March 1792, he had made a very fair skeleton map of Mysore, whilst another map was produced at home by Rennell from the surveys of Beatson and Allan.

Emmitt, of the Bombay Infantry, was attached as surveyor to the Marātha army which marched down by Dhārwār to co-operate in Mysore. His work ran through country that had never been surveyed before, and included a continuous line from Poona to Seringapatam, a survey of the Tungabhadra River to its junction with the Kistna, and a line from that point westwards through Dhārwār, down to the coast at Goa.

Reynolds accompanied the Bombay army to Malabar, and with Johnson of the Engineers took lines of survey from that coast into Mysore.

At the close of the campaign Kyd sent out surveyors on various tasks. He himself carried a line from Seringapatam over the Ghāts through Coorg, down to the west coast and through Cannanore to Anjengo. Anburey and Blunt, of the Engineers, surveyed a line to Hyderābād, and during the following cold season continued it through Berār and Saugor to Kālpi, whilst at the same time Reynolds took another line from Hyderābād to Agra.

Under the treaty of 1792 Tipu had to cede to the Company the province of Malabar, and the districts of Dindigul and Salem, besides other territories to the Marāthas and the Nizām.

Malabar was allotted to the Bombay Presidency, and arrangements were at once made for its survey which was started by Emmitt and Johnson. The difficulties of the country were prodigious, and the work dragged on for several years, other officers employed being Moncrieff and Williams of the newly raised Bombay corps of Pioneers.

The civil charge of Salem Districts was entrusted to Captain Alexander Read, who engaged John Mather to survey the district which included the Bāramahāl, a hilly tract to the north. Though not based on regular triangulation, this was the first district survey based upon a system of theodolite bearings and intersections as opposed to the usual of perambulator traverses. It took nearly five years to complete, and established Mather's reputation as a skilled surveyor.

At the close of the Mysore campaign, the so-called Subsidiary Force returned to Hyderābād, and Mackenzie was appointed to it as Engineer and Surveyor, with particular instructions to devote himself to the geography of the Deccan, a task into which he threw his whole heart and energies. Although he was called away more than once to other military duties, he returned each time to his post at Hyderābād, until in 1798 he marched down with the Nizām's army to take part in the final campaign against Tipu.

Early in 1793 Topping was deputed to Masulipatam to undertake a survey of the Kistna and Godāvari rivers, and report on the possibility of an irrigation project. He ran lines of levels and laid down permanent bench-marks, and reported that the idea seemed to be practicable, but that further investigation was desirable.

He died in January 1796, whilst still on this duty, and though Caldwell and Beatson were in turn in charge of the work for short periods, the project was dropped, and not revived till nearly fifty years later.

In 1790 the Company had taken over the administration of the districts of the Carnatic, and to assist in their development, Topping proposed an establishment of Assistant Revenue Surveyors to work under the district officers. At his suggestion a school was founded for their professional training, and placed under charge of Goldingham at the observatory. After Topping's death Goldingham succeeded to his duties as Astronomer and Marine Surveyor, and was also allotted the duties of Inspector of Revenue Surveys. The first duty of the revenue surveyors was the preparation of a topographical map of the district, to which they added such information about cultivation and the possibilities of irrigation as would be helpful to the district officer.

The detailed measurement of individual fields was a matter for which the native staff remained responsible, and the first effort to bring order and system to these measurements, so that they should form a fair basis for the settlement of revenue, was made by Read in the Salem District. The district officers in Bengal had never succeeded in obtaining satisfactory or trustworthy results from such measurements, and in 1793 Lord Cornwallis authorised the introduction in that Presidency of the system of Permanent Settlement, which it was hoped would, amongst other advantages, obviate any interference of Government with details of revenue collection.

The Bengal Presidency was now rapidly extending its contacts with its neighbours.

In 1793 Kirkpatrick led a mission into Nepāl, marching up the Rapti valley; he had to return almost at once, but brought back an interesting sketch map of his route.

In the autumn of 1792 the Rāja of Assam appealed to the Governor General for assistance against his rebellious subjects, who had driven him from his capital, and were besieging him at Gauhāti. A small force was sent up under Captain Welsh, who relieved Gauhāti, won a remarkable victory over the rebels, and restored the Rāja to his capital. At the special desire of Lord Cornwallis, Thomas Wood was sent up with Welsh to make such surveys as he could of this country, about which nothing whatever was known. By the time that the expedition was withdrawn in 1794, Wood had carried the survey of the Brahmaputra from the point near Goālpāra where Rennell had left it in 1765 as far as the Dikho River below Sibsāgar.

The following year Wood was attached to the embassy conducted by Captain Symes to the court of Ava, and made an excellent survey of the Irrawaddy River. Beyond a visit to Pegu the mission saw little else of the country, but Buchanan, who accompained it as medical officer, collected a vast amount of interesting information about the various peoples and tribes and the general geography of Burma, a country of which, as in the case of Assam, nothing whatever had been known before.

Towards the end of 1798 Wood was posted to the army stationed in Oudh, and during the next four years carried his lines of survey hither and thither through Oudh and Rohilkhand; up to Hardwār, and down the Ganges as far as Cawnpore.

Colebrooke had always been an enthusiastic surveyor, and after becoming Surveyor General in 1794 made several excursions himself. the most important of which was during the season 1796–97, when he surveyed the Cossimbāzār River, and continued up the Ganges as far as Colgong. James Hoare surveyed the Jumna from Allahābād to Delhi, and Mouat, at the close of the Rohilla war of 1794, surveyed the boundary of the *jāgīr* granted to "Ahmed Ally Khan", which is now known as Rāmpur State.

Perhaps the most interesting survey of this period was the line taken by James Blunt from Chunār southwards through the very heart of India, across the head waters of the Son and the Mahānadi, down the Wainganga, Wardha, and Godāvari, to the east coast, through a country which had never been explored before; meeting several adventures with Khōnds and other inhospitable people.

Reynold's last excursion in the field was during season 1793–94 when, after a special visit to Calcutta, he obtained authority to make a survey of Sindhia's territory at the head of the Jumna–Ganges *doāb*, and extending beyond Delhi. For the rest of his service he devoted himself to the compilation of his great map of Hindustān, with particular attention to those parts which lay outside the Company's territories. He made his headquarters at Surat, and sent out native surveyors trained by himself, who explored Sind, Rajputāna, the Punjab, and other little-known parts, for which his map was for many years the only authority.

At the end of 1798 preparations were started for the last deal with Tipu of Mysore, and the Governor General once again moved down to Madras to take personal control, though this time Lord Mornington did not take the field. His most trusted adviser for the organization of the campaign was Alexander Beatson,

whose knowledge of the military geography and the conditions of warfare in the south was acknowledged as unrivalled. Beatson was given the honorary post of Surveyor General to the Grand Army, and both he and Allan played prominent parts in the brief campaign which ended with the capture of Seringapatam and the death of Tipu. Mackenzie held the responsible post of Engineer in charge of the batteries on the northern bank of the Cauvery, whilst an elderly subaltern of H.M.'s 33rd Regiment, William Lambton, was Brigade Major to Sir David Baird, and took the lead in the final storming of the ramparts.

Mysore was now shorn of the outlying districts which had been acquired by Haidar Ali, and a commission was appointed to settle details. Mackenzie attended and provided them with the best maps he could put together, though he found the materials available for the remoter districts and boundaries both scanty and conflicting. It was decided that a survey of Mysore and the newly ceded territories should be put in hand at once, and orders appointing Mackenzie to this task were issued by the Governor General in September 1799, before he returned to Calcutta.

Whilst Mackenzie was engaged in collecting his materials, officers, and equipment, Lambton continued as Brigade Major with the Grand Army during its preliminary clean-up round the north-western districts of Mysore.

The 18th century had yet over a year to run, but we will leave the story at this point, with Mackenzie making preparations for the first great topographical survey, and Lambton yet to propound his scheme for a trigonometrical survey, to extend right through the peninsula, continuous and indisputable.

CHAPTER II

BENGAL SURVEYS TO 1777

Jesuit Missionaries, 1579 to 1771 — The 24-Parganas, 1757–64 — Coasts & Islands — The Great Rivers — Midnapore & Burdwān, 1761–6 — Rennell & Richards, 1765–6 — Bihār, 1766–8 — Route Surveys — Rennell as Surveyor General, 1767–77.

THERE are many records of the care with which the Mughal Emperors had their main roads measured, and sometimes marked, in *coss*. Father Monserrate describes the measurement of Akbar's[1] march to Kābul in 1581;

Furthermore, he orders the road to be measured, to find the distance marched each day. The measurers, using ten-foot rods, follow the king, measuring from the palace. By this one operation he learns both the extent of his dominions, and the distances from place to place, in case he has to send embassies or orders, or meet some emergency. A distance of 200 times the ten-foot rod, called a *coroo* in Persian, or *cos* in the Indian language, equal to two miles, is the measure for calculating distances[2] [247].

Rennell records the distance, stage by stage, of the "Great Road from Moorshedabad to Delhy, measured by order of the King" but gives no date or name[3]. In his map of 1804 [234] Wilford used distances from Delhi to Kābul and Lahore to Multan, measured by order of Shāh Jehān[4].

In another place Rennell acknowledges the receipt of

the registers of the actual measured distances, as taken by the orders of the Emperors Acbar, Shahjehan, and others, on the great roads from the city of Lahore, Cabul, Ghizni, Candahar, and Moultan; and back to Lahore again; as well as those between Cashmere and the cities of Lahore and Attock, respectively; and between Cabul, Balk, and Bamiam; besides many others; ... (require an allowance for the inflexions [184–5] but superior to vague report or judgement).

These were without "direction of compass", and "latitude but seldom given".[5]

In compiling their maps of India, both D'Anville and Rennell made use of every record they could find of the distance of one place from another, and give special weight to any distance that had been actually *measured* rather than *estimated*.

Apart from the official measurements above referred to, no traveller would have been given opportunity to make actual measurements, and geographers had to do their best with estimates of distance recorded by travellers and historians, and the early Arab and Persian geographers [pl. 4]. One of these travellers was the French diamond merchant Tavernier who made several journeys through India between 1640 and 1667, keeping a record of the distances marched stage by stage, and describing the rivers and mountains he crossed; his more important routes were,

Surat – Ahmedābād – Jaipur – Agra.
Surat – Asīrgarh – Gwalior – Agra.
Agra – Delhi – Lahore – Kābul – Persia.
Agra – Allahābād – Rohtās – Dacca.
Surat – Aurangābād – Hyderābād – Masulipatam.
Goa – Hyderābād.
Hyderābād – Kurnool – Madras.[6]

Much valuable information came from the Jesuit missionaries, who had stations in many parts of India from the 16th century onwards[7], and included many men of scientific habit, who recorded details of their journeys, sometimes taking astronomical observations for latitude and longitude [149–50] and compiling sketches and

[1] Emperor of Delhi 1556 till his death in 1605. [2] From the Latin of *Commentarius* (580), 8–2–1581. [3] La Touche (106). [4] Emperor of Delhi 1627–58. [5] Collected at Delhi by Kirkpatrick, *Memoir*, 1793 (83) [42]. [6] Ball. [7] The Society of Jesus gained its first hold in India in 1542; Maclagan (xx).

maps. Both D'Anville and Rennell refer constantly[1] to "*Lettres Édifiantes et Curieuses*", which was the authorized publication of selected letters from Jesuit missionaries in all parts of the world[2].

One of the earliest of the Jesuit surveyors was Father Monserrate, a member of the first Jesuit mission to the court of Akbar in 1579, which travelled by sea from Goa to Damān[3], marching thence to Surat, and on to Fatehpur Sikri[4]. In 1581 he accompanied the Emperor on his march to Kābul, and left a long list of geographical positions, and a most interesting little map of India [pl. 10]. So far as is known the first use of his work was made by Thomas Call, who in 1784 reported that he had embodied into his atlas of India [215–6],

an actual survey of Padri Monserrat from Delhi to Cabul. ... A cursory survey taken by him with a compass and corrected by observations of Latitudes from Goah to Delhi[5].

Mention is made elsewhere of the work of Father Bouchet in the south peninsula [238], and of others who travelled through the mountains to Tibet [67–70].

Of more immediate interest to Bengal was the work of Father Boudier, who was stationed at Chandernagore from 1719 till his death in 1757, and made many astronomical observations that were of the utmost value [150]. During a notable visit to Jaipur and back in 1733–4, he not only fixed the latitude and longitude of many important places, but kept up a survey of his route between Agra and Allahābād which gave "the description of places on this road ... with the computed distance of each from the course of the Gemne[6] and the Ganges[7]", which D'Anville was glad to make use of.

Father Tieffenthaler was one of the most enthusiastic geographers of all. When he came out to Goa in 1743 he was already a skilled astronomer, and from that year till his death in 1785 he devoted himself to the cause of geography, keeping a record of all his journeys from place to place, and a register of all the astronomical positions he observed [150–1].

His more important travels included a land journey from Damān to Surat, and through Udaipur to Agra during 1744. With headquarters at Narwār[8] from 1747 to 1765, he travelled to Bombay through Burhānpur and Nāsik[9] in 1750, visited Goa, and then returned up the west coast to Broach and Cambay, and reaching Ajmere[10] turned east through Jaipur to return to Narwār in April 1751.

In 1765 he travelled from Narwār through Chhatarpur[11] in Bundelkhand to Allahābād and Benares, still keeping up his surveys and observations. At Benares he

resolved to study the middle and the lower course of the Ganges, instead of completing the remainder of his journey by land. His object was not to register the latitudes of the towns along the banks ... for these had already been measured by Father Boudier ... and others. What he wanted was to obtain an accurate idea of the manifold windings of the river and the exact number of its affluents. The former were mapped by means of a compass[12]; as to the latter, he not only noted their names, but carefully sketched their junctions with the main stream.

After a short stay in Calcutta he

returned to Upper India, studying carefully ... all details what might have escaped him on his downward journey. ... Instead of returning to the West, he started from Allahabad in ... January 1766, reaching Oudh ... on 3rd February. ... From thence he set out to explore the whole province of Oudh till the year 1771[13].

By 1775 he was able to send home to Europe the results of his surveys. To Copenhagen he sent his book on the geography of India, a form of gazetteer; whilst to Anquetil-Duperron in Paris [72] he sent his maps;

The first of these maps measured 15 feet in length, and represented the entire course of the Ganges. The second and third maps outlined the river Gogra in two sections, of which the first, measuring 11 feet, pictured the upper course of the river, whilst the latter, $6\frac{1}{2}$ by 6 feet, represented its lower course, ... [There were also] 21 detached drawings of the confluents of various tributary rivers of the Ghogra and Ganges[14].

[1] Herbert & *Memoir*, 1783 [*passim*]. [2] 34 vols. issued in Paris between 1702 & 1741. Edn. 1780–3 in 26 vols. by Querboeuf, vols. X to XV referring to India, Maclagan (15). [3] 46 D/15. [4] 54 E/12. [5] BPC. 29-11-84. [6] Jumna R. [7] Herbert (25). [8] 54 G/14. [9] 47 E/13. [10] 45 J/11. [11] 54 P/9. [12] See also Bernoulli, II (292). [13] Noti (400–1). [14] Full description, Bernoulli, II (266–8).

Anquetil combined, at his own expense, the three principal ones, and produced a general map representing the entire courses of the Ganges and the Ghogra, on a considerably reduced scale[1]. ...

It was above all, Tieffentaller's map of the Ghogra basin which was most appreciated by the geographers of Europe. They came to know about it for the first time, and were astonished, says Anquetil, at the sudden appearance on the map of India of a large river 500 coss long, having 29 affluents[2].

Tieffenthaler had employed "an Indian expert to study the upper course of the Ghogra river and its affluents" and he filled in the detail of the upper course of the Ganges through the mountains from information collected, but made no attempt himself to travel into the hills [73].

In a letter written to Anquetil-Duperron in 1759 he expresses the delight he took in this geographical work, which may indeed be taken as typical of the spirit in which the missionaries and other pioneers devoted themselves to the cause;

Next to the salvation of souls ... nothing has afforded me greater pleasure than the study of the geographical position of places, the variation of winds, the nature of the soil and the character and manners of the regions through which I am travelling ... thereby to acquire a greater knowledge of the Creator and fix my mind on things heavenly[3].

It does not appear that any of Tieffenthaler's surveys or astronomical observations reached either D'Anville or Rennell, or were otherwise made use of, before the publications of Duperron and Bernoulli, 1784–7 [72] which Rennell received in time for the 1788 edition of his *Map of Hindoostan*[4]. Thomas Call however, had already received copies from Tieffenthaler in India, and in 1784 reports that he had embodied into his Atlas of India

Routes taken between Goah and Agra by Padri Tieffenthaller;
A Survey of the country N.W. of Delhi by Padries Windell and Tieffenthaller[5].

Father Wendel was closely associated with Tieffenthaler and they had for several years been the last representatives of the Society of Jesus in India; for in 1759 the King of Portugal had banished all Jesuits from Portuguese colonies, and in 1773 the Pope abolished the order altogether; it was not resuscitated till about 1813[6].

THE 24-PARGANAS, 1757–64

We turn now to surveys by officers of "the Honourable John Company", whose first acquisition of territory in Bengal, beyond the narrow lands of Calcutta, was the 24-Parganas, ceded by the Nawāb of Bengal[7] after the battle of Plassey[8].

There was no delay in proposing a survey, for the Council at Fort William record on August 1st 1757 that Clive had written from the Nawāb's capital at Murshidābād,

informing us that the Canoongoe's[9] men had set out from thence to take an account on behalf of the Nabob, of the lands, villages, districts, revenues, etc., ... of the Territory from the Great Lake[10], Eastward of Calcutta, as far as Culpee[11] South; but as it may be impossible to determine a proper boundary merely from the report of these people, they recommend it as a concern worthy of our most diligent and serious attention, whether the best method would not be to send boats on the Great Lake with directions to trace its source, examine its depth, etc. That other boats might be sent into Culpee River, and if the design is executed by experienced men, an exact and useful survey may be made which will enable us to settle beneficial boundaries[12].

The Council referred to the fleet for a surveyor, but Admiral Watson[13] replied,

[1] Map pub. at end of Bernoulli, II. [2] Noti (410–1). D'Anville's map of 1752 gives no indication of the Gogra; cf. Bernoulli, II (263, 346, 433–4). [3] Noti (146), from the Latin letter pub. Bernoulli, II (419–21). [4] *Memoir*, 1788 (vi). [5] BPC. 29–11–84. [6] English Jesuits first came to Calcutta in 1833. [7] BSM. 30–7–57, Mīr Jafar confirmed secret treaty made before Plassey ceding "all the land lying to the South of Calcutta, as far as Culpee"; formal treaty ceding the whole 24-Parganas, 20–12–57. [8] 79 A/5; 23–6–57. [9] *kānūngo* [135]. [10] From 5 to 10 m. E. of Ft. William. [11] Kulpi, 79 B/4. [12] BSCC. 1–8–57. [13] Admiral Charles Watson, who commanded the fleet at recapture of Calcutta. d. 16–8–57, near Calcutta. Ives (177).

I have received your letter of this day's date, acquainting me with the necessity you are under of having an exact survey and regular Plan of the Lands granted to the Company by the Nabob, and requesting I would assist you from the Squadron with such men as are properly qualified for such an undertaking. It appears to me to be a work requiring so much care and exactness that I know of none in the Squadron capable of it, and if there were, I am very certain such a performance would require much more time than I shall continue here. But if upon an enquiry you find anyone who will answer your purpose, and is willing to remain in India, I will give orders for his being discharged[1].

A civil servant, William Frankland, was appointed to the task, and in December 1758, the Council reported[2] that he had made a five months survey tour, and collected much valuable information of a revenue nature, but said nothing of any map [136]. Capable surveyors were however found before long, and within a year an engineer officer of the artillery company [266], Robert Barker, made a traverse survey from the Salt Lakes, down the Mātla River, and then westwards through the creeks to Rangafulla[3] on the Hooghly[4].

In 1761 the Council appointed Hugh Cameron, to be "Surveyor of the New Lands[5]", an appointment which he held till his death in March 1764. Cameron's survey of 1761–2 is a very fine skeleton map of the 24-Parganas, mainly of the exterior boundaries, on scale 1½ inches to a mile[6]. It shows the left bank of the Hooghly from north of Barrackpore to south of Kulpi, the country eastwards from Barrackpore to Basīrhāt[7], then southwards down the rivers and creeks, and west to join the Hooghly about 25 miles south of Kulpi. Along the Jamuna River is written — on the right bank "A fine country belonging to the Company" — and on the left bank "The Nawāb's Country". One of the channels into the Salt Lakes bears the note "This way Honey & Wax are brought to Calcutta", and to the south in the Sundarbans, is another note "Here those who come to gather Wax & Honey in their season, sacrifice to Juggernauth". Old Fort William is shown, with the outline of the new fort and the village name Govindpur alongside.

Rennell makes several references to Cameron's survey[8], and in January 1767 directs Richards to connect with it on the Ichāmati River near Bangaon[9].

In 1762 the Council resolve that

Mr. Cameron being returned from his Survey of the Boundaries of Company's New Lands, ... may be able to give us some account of the soil, Produce etc., of the same, which may prove a Guide to the Company in some measure in sending proper orders for the Management of their Lands[10].

Cameron's interesting report says,

My survey led me along the East side of the River Hughly, the Company's limit westward, and from the banks eastward I could discover all along fine extensive fields of ripening Corn. That was in the latter end of October and beginning of November. ... the country everywhere abounds with cattle. As to the southernmost parts of the Company's Lands, from Rangafullah down to Sagar[11], and up again, ... the banks are bordered with impenetrable Jungull ... How far these Jungulls extend inwards I cannot say ... I have never seen the Inland parts[12].

His subsequent surveys were of a revenue nature, and are referred to in a later chapter [136]. A full topographical survey of the southern *parganas* was made later by Claud Martin [51].

COASTS & ISLANDS

In the very early years merchants trading in India were but little interested in the interior of the country[13]. Their factories were situated either on the sea coast or, as in Bengal, up the estuaries of the great rivers. Their first concern was in

[1] BSCC. 13–8–57 & Long (245). [2] B to CD. 31–12–58 (101–11). [3] Rāngāfala, 79 B/4; 5 m. below Kulpi. [4] Map, BM. Addl. MSS. 15739 (2). [5] B to CD. 12–11–61 (80). [6] *Plan of the Company's Lands and Lakes.* MRIO. 51 (6). [7] 79 B/14. [8] La Touche (88, &c.). [9] 79 A/16. [10] BPC. 5–4–62. [11] Ganga Sāgar, 79 C/2. [12] BPC. 8–4–62; his expenses from Oct. to March were Rs. 2,592-15-6. [13] Tavernier [10] was a notable exception.

their communications with the open sea and Europe, so it is natural that amongst the earliest surveys of Bengal should be those of the coasts and river approaches.

There are charts of the coasts of Pegu and Arakan dated 1680 [221] whilst later and more accurate charts are from surveys by the French navigator Après de Mannevillette[1], who published his maritime atlas, *Neptune Orientale*, in 1745 [1].

From time to time ships[2] of the East India Company were lost along the Coromandel coast[3] and off the Ganges delta [45]. Rennell points out that though

the difference of longitude between the towns of Balasore and Chittigong...is 4° 53′;...the charts, so late as the year 1752, represented the difference of longitude between these two places to be only 3° 48′; that is 1° 5′ less than the truth...which doubtless occasioned the loss of many ships, who trusted to the information[4] [152].

The passage by open sea from Calcutta to the factories at Dacca and Chittagong being particularly hazardous at many seasons of the year, a safer passage was sought through the Sundarbans.

The first regular surveys of these coasts were made by Bartholemew Plaisted who had come to India as a sea captain. In 1761, immediately after the cession of the provinces of Bengal [21 n 7], the Council wrote to the Directors that,

being...advised that Mr. Plaisted's assistance would be very useful in compleating the Surveys of the River and Coasts near Chittagong, we have employed him on that service, esteeming it very essential...[5]

and the same month the Chittagong Council sent in his maps, saying,

Accompanying this your Honour...will receive Capts....and Plaisted report to us of the Coast of Chittigong from this place to the Latitude of 21° 10′, with a draft of the same...

Mr. Plaisted will return to Luckypore[6] & from thence take a survey of ye River, Sea Coast, the Isld. of Sundiva[7], & all shores, shoals, & soundings that lay betwixt Luckypore and Chittigong, a draft of which we think will be exceedingly necessary. As soon as he has completed this, he will [proceed] again through the Sundry-Bunds, & finish his survey of ye Rivers their, & their outlets which may also prove of very great advantage & enable him to lay before your Honor, & on his arrival in Calcutta, a Complete Draft of all ye Harbours, Rivers, Shores, Shoals, Soundings etc. that lay betwixt Calcutta & Chittagong[8].

Again,

Accompanying this we forward to you Mr. Plaisted's Book of Drafts containing his surveys of Rivers etc. between Calcutta & this place, as far as...yett done together with his remarks[9].

These are acknowledged;

Mr. Plaisted's Draughts with his observations are a very useful performance,and meet with our approbation. As we find him so well qualified for this material business, we direct him to continue his survey of the parts adjacent to Chittagong, & the different Branches of the Ganges for the present; and, when the season will permit, of the Coast between the Islands of Sundeep and Saugre[10], towards the sea, by which means the Chart[11] will be completed[12].

The Fort William Council wrote home again in November,

Finding Mr. Plaisted's services very useful at Chittagong in Surveying the Creeks, Rivers, Islands, &c, on that Coast, we venture to detain him still, notwithstanding your appointment of him to Bombay, judging his present employ to be of great Importance.[13]

and in December Chittagong reported

Mr. Plaisted had again been to the Southward, and finished his survey as far as Cruz Colly[14]. ...He will proceed on his Surveys...as soon as he can be furnished with proper vessels for that purpose...[15]

and the necessary vessels were sent from Calcutta.

In addition to a fresh survey of the Chittagong coast, "executed on a larger plan, and more correct than his former", Plaisted submitted detailed instructions for navigation, and an account of his methods of survey, mostly observations of the Sun's declination with several quadrants[16].

[1] His chart of *East Coast of Hindostan* extends from 13°N to 23°N; BM. Addl. MSS. 15319 (7). [2] Known as East Indiamen. [3] The E. coast from Palmyras Point to Point Calimere [101]. [4] *Memoir*, 1793 (37). [5] B to CD. 16-1-61 (167). [6] Lakshmīpur, 79 J/13. [7] Sandwīp, 79 N/7. [8] *Chittagong Dist. R.* (198); from Ch. & C, Islamābād 28-1-61; Islamābād is the old name for the town of Chittagong. [9] ib. (211) of 17-3-61. [10] Sāgar 79 C/6. [11] *Survey of the Coast of Chittagan, & the River up to Dacca. Imp. Lib. M & P.* 343. [12] From G in C. to Islamābād, 30-6-61. [13] B to CD. 12-11-61 (132). [14] Khuruskul, 79 O/15, on the Arakan border. [15] BPC. 28-12-61. [16] BPC. 26-1-62.

When publishing these navigation instructions with later surveys in after years, Dalrymple points out that Plaisted's survey was by no means complete, and that there are many dangers in the Offing, and perhaps also near the Coast, not described with sufficient precision for the security of Navigation[1].

The Council sent Plaisted to "Cat Colly" to survey the damage done by an earthquake, and on May 1st 1762 he reported,

The earthquake that happened on the 2nd of April... has made such devastation, that nothing but a view of the place would give credit to the several reports made thereof. ... The Black figures express the former & the Red the present soundings. The Prikt line among the trees shows where the former borders of the creek were, while the trees shew how far they now stand in the Water; I sailed through the middle of them & sometimes found four fathom[2].

The Directors were anxious to keep these surveys of their harbours secret;

Mr. Plaisted in his second survey to the Southward of Chittagong, discovered a Harbour for Shipping of which he sent a plan... We would have the survey made as correct as possible, and direct you to send all the information you can... and here We must caution you, to keep this knowledge of the Chittagong River as confined as you can, that Foreign Nations may not be acquainted with it[3] [000].

Early in 1765 Plaisted was surveying the Meghna River [23], and in 1766 he made a survey "over to Balasore", and also of Channel Creek, employing two European assistants [283], and two or three sloops[4].

After his death in 1767 the survey of the Sundarbans was carried on by John Ritchie, and in 1769 the Council reported,

The Surveys to the Eastward are completed so far as regards the Outer Sands and mouths of the several Inlets, and the interior Surveys are now making; a very accurate Plan of this useful work hath been delivered in to us by Mr. Ritchie who was employed in this important Business. His Assiduity in this Duty and the accuracy with which this Plan appears to have been executed hath recommended him highly to our notice...[5]

and the following year,

We have the pleasure to send you... a Chart of the Eastern parts of India according to the latest Surveys; and as it requires much time & pains to make out these charts, we request you will get some copies engraved and send them out to us. Those you favoured us with last year are very inaccurate[6].

and again,

We forwarded to you... a plan of the Mouth of the Calcutta River or Western Branch of the Ganges, as likewise a Chart of the Bay of Bengal from Point Palmyras to the Coast of Arracan[7].

Dalrymple gives the following description of his earliest chart of the Bay of Bengal, in one plate north of parallel 19°, engraved and published in 1772[8];

It must appear very extraordinary, when it is considered how long the *Europeans* have had an intercourse with *Bengal*, that there is not hitherto a *particular* chart of the *Bay* of *Bengal* published in any language.

The Honourable Thomas Howe... in the year 1763... went to the Coast of Orixa; in his passage from thence to Bengal he had an opportunity of correcting the Charts of this Coast in the *Neptune Oriental*; and having reduced to a *general scale* all the particular Charts in his possession of the Coasts &c. of the *Bay* of *Bengal* he connected them together in the best manner he could.

Soon after my return to England in 1765, Mr. Howe gave me a copy of his Chart: and encouraged me to revise and improve it from what materials I had collected: accordingly I set about this work and reduced the Coast of *Orixa* to a scale of 3 inches to 1°...

Plaisted's Survey of the *Coast* of *Chittagong*, served, both in Mr. Howe's Chart and mine, for the description of that Coast; but I added, from other authorities, some Banks remote from the Land.

The Coast of *Ava*, from *Negrais* to *Cheduba*, I laid down from various materials, but I found so great a disagreement in the Latitudes,... that I desisted from my intention of having the Chart engraven[9].

[1]Note dated 1-3-85, Ritchie (iii). [2]BPC. 17-5-62. [3]CD to B. 24-12-65 (49). [4]BPC. 12-1-67. [5]B to CD. 25-9-69 (19). [6]B to CD. 25-1-70 (94). [7]B to CD. 12-2-71, (82). [8]*Imp. Lib. M & P.* (350). [9]Dalrymple, *Memoir of a chart of the Bay of Bengal*; 31-3-72 (1, 2).

In 1770 Ritchie was sent in the Snow *Diligent* to make a *cursory Survey* of the Coasts and Islands around the Bay of Bengal: ... The Orders...were "not to lose time, by entering into any *River, Bay,* or *Inlet,* but to keep our *Track* of *Soundings* as unbroken as possible; and determine the great *outline* of the *Land,* and *position* of the *Islands,* the present Trip being only meant as introductory to a *General* and *accurate Survey* of the whole[1]."

The following extracts are taken from his journal;

November 1770. 30th. Weighed anchor from Calcutta.
December 2nd. Culpee. ...
7th. Saw the Coast of Aracan. ...
8th. Commenced Survey Southward from St. Martin's Island. ...
14th. Saw Cheduba[2] [160]. ...
20th. At 10 min. past 7 A.M. died Mr. James Wright, our second mate; it seems he was ill before we left Calcutta, but concealed it, until we were at Sea, for fear of preventing his voyage. ...
21st...the whole Coast of Aracan presents a most dreary and inhospitable Prospect from the Sea. ...
Jan. 4th. 1771. Chief Mate landed on Preparis[3]. The only visible Inhabitants being Rats, Squirrel and Monkies, and to the last mentioned Gentry we were obliged for pointing out the *watering place.* ...
13th. Narcondam[4]. ...
16th. In a good harbour formed by the cluster of Islands and the Andaman. ...
20th. [Meet Andaman Islanders; long account of incident; entice a few of them on board, where they stayed content and inquisitive for a few hours, and left with presents of cloth and iron[5] [48]].

Although we were about the Island till the end of January, not a boat or man was seen by us afterwards. ...
[Note by Dalrymple] I have the copy of an old Portuguese Chart of the Andaman Islands... in which this very Strait (Diligent Strait) is laid down. 11° 59′N.
[Note by Ritchie] The Plan of *Great Andaman Island,* as laid down in the Sea Charts, will do as well for any *other Island* as for *It*; for it has no sort of resemblance to it, either in form or extent. ...
Jan. 30th 1771. We are now about to leave the *Great Andaman Island,* of which hitherto nothing was known, and what we have been able to do will mend the matter but little.
31st....along the *West side* of *Little Andaman.* At 10 A.M. we saw three Men upon the beach, in a little Bay...but upon our approaching within about 1/2 a mile of the shoar, they fled into the woods. ...
Feb. 9th. Carnicobar[6]....the appearance of this beautiful *Island,* and goodnatured freedom of *its inhabitants* was extremely pleasing. ...
March 3rd. Entered Noncovery Harbour[7]. Found some Danish Missionaries...spent 15 days there...Had an opportunity of copying the rough Plans of our Survey so far, and of surveying and examining this most excellent Harbour. ...
[Note by Dalrymple] I was at this Harbour in 1762, and communicated a copy of Lindsay's Plan to Governor Pigot. ...
March 24th. Light Airs and Calms throughout; we begin to suspect, that the *surveying* business is at an end for the season on this Side of the Bay, and the Monsoon about to shift. ...
31st. We have been drove by the Current to the Westward of all the Acheen Islands [47 n. 2] without seeing them by reason of the haze and Fogs. Make for the Choromandel Coast. ...
April 17th. At 9 A.M. saw the *Hills* of *Sadrass* and *Mount Saint Thomé,* and shortly after saw the *Ships* in *Madras Road.*

The Journal now ends;

We had only to carry a *Line* of *Soundings* along a well known shoar, from *Fort St. George* up to the *Road* of *Balasore,* in which track very little new was likely to occur. Indeed the only alteration that happened was in the *Shoals* of *Armagoan* [104 n. 2], the *False Point* of *Divi,* and the *Point* and *Bank* of *Godavery,* or *Gardaware,* all which my Plans will shew sufficiently distinct[8].

It is apparently of this survey along the east coast that Rennell writes, that Ritchie

[1] Ritchie (v, 3). [2] 18° 45′ N, 93° 40′ E. [3] 14° 52′ N, 93° 40′ E. [4] 13° 25′ N, 94° 15′ E. [5] Ritchie (47–52) cf. encounters by Blair & Colebrooke [48–9]. [6] 9° 10′ N, 92° 45′ E. [7] Nancowry [48–9]. [8] Ritchie (5–94).

in 1770 and 1771...took a series of bearings and distances, which he corrected by the latitudes, along the whole coast between Point Palmyras and Madras...

He surveyed from Balasore to Palmyras Point by a series of triangles formed by three surveying vessels, and corrected for latitude[1].

A complete series of Ritchie's surveys, as completed by 1771, was examined and compiled by Rennell, and sent home as *A set of General and Particular Maps of the Bay of Bengal*[2] [224]; and in an introductory note to Ritchie's *Journal*, Dalrymple writes, on March 1st 1785,

All the pieces, in my possession, of the Coasts of Chittagong, Arracan, and Ava, are now engraven; ... *every one* contained something omitted in the *others*[3].

Ritchie writes of his survey in 1777,

All that is yet known concerning the Andaman, is only what was collected from a cursory survey of the Eastern part of them in the year 1771. The Western part is almost Totally unknown, both as to form and extent, and the Harbours, all except one, are as yet unexamined. ... We have not taken possession of these Islands, and consequently there can be no claim of Sovereignty in our favour, in case of national disputes with our Natural Enemies....

I will just mention farther that the Coast of Arracan remains unexplored, any farther than by a single line of Soundings which I carried along it, at some distance from the land....[4]

He suggested that Government should fit out an expedition to make good these deficiencies, but the matter was deferred [45–6].

THE GREAT RIVERS

For many years after the acquisition of Lower Bengal the waterways provided the most important lines of communication, especially for the purposes of internal commerce, and the Ganges River was the great highway to and from the Company's stations up country[5].

The direct line from Calcutta to the Ganges lay up the Cossimbāzār[6] River past Murshidābād[7], and its survey was the first task allotted to De Gloss on his appointment in February 1765 [22]; three months later he submitted his maps, writing,

I have the pleasure to think that these drafts will be found on examination to be as correct as was possible for any to be, having measured the whole as exact as the Nature of the Ground would admit of[8].

During the dry season boats could not, however, get through the shallows at the head of the Cossimbāzār, but had to go down the Hooghly from Calcutta, through Channel Creek and the Sundarbans, to reach the Ganges in the direction of Dacca. It was to save this long detour that in April 1764 James Rennell had been sent to carry out

the Survey of y^e^ great River to the Eastward of Jelenghee[9]...to find out the shortest & safest Channel leading from the great River to Channel Creek...

For this purpose you will coast along the South side of the great River & examine every Creek or Nulla which runs out of it to the Southw^d^, tracing them as far as you find them Navigable for Boats of Three Hundred Maunds[10] Burthen & informing yourself...whether they are...Navigable all the Year[11].

On May 7th Rennell left Fort William by boat, with a party of 39, including an "assistant surveyor" and "3 other Europeans" [283]. The very first night at one in y^e^ morning I was awakened by an alarm of y^e^ Budgarow's sinking, & indeed she was on the point of it, being 2/3 full of water. By this accident I had most of my Stationary spoiled, & likewise a great part of my Clothes. Stayed at Calcutta this Day, & repaired the Leak.

[1] *Memoir*, 1793 (10). [2] IO. Maps. AC. 13; List, Markham (4). [3] Ritchie (iii). [4] IO. Copies 40-1777 (41–3) 2–1–77. [5] John Marshall, a Company's servant, 1668–72, describes the river journey to trading stations at Patna, & at Singaya on the Gandak, *John Marshall* (30 *et seq.*) [6] or Bhāgīrathi. 778 D/8. [8] BPC. 29–4–65. [9] Jalangi, 78 D/12. [10] 28 maunds to the ton. [11] From Henry Vansittart Governor, 6–5–64; La Touche (9). Henry Vansittart, Governor 1760–4; lost at sea on return voyage to India, 1770. From here onwards Rennell's journal, 1764–7 (La Touche) is freely quoted.

Taking various useful observations of the breadth and depth of the river, the variation of his compass, and so forth, Rennell reached Jalangi on the 19th and then had to arrange for boats;

Before I left Calcutta the Governor informed me that a convenient Budgarow with as many Willocks[1] as I should want, would be in waiting for me at Jelenghee... but on my arrival... I found neither Budgarow nor Willocks. ... The Budgarow I came in was very unfit for me to do my business in during ye approaching wet Season, both on account of its smallness, & leakiness. ... I set about getting some better Willocks for the Surveying People, but had little success... I could procure only 2; ... besides these I kept 3 of the Calcutta Willocks, & sent the other two to Calcutta[2].

On the 21st he writes,

This afternoon began the Survey of the Southern Bank of the Ganges about a mile above Jelenghee River...[3]

and his journal continues,

The 22nd... this afternoon we had a Specimen of the weather that we might expect in ye great River at this Season; for in ye evening in crossing ye River... a violent Squall from the SE drove all the boats ashoar on ye Jelenghee Sand, where they continued beating all Night; 2 men were blown overboard during ye Squall but fortunately swam ashoar[4].

From now he journeyed down the river making a continuous survey of the south bank, and exploring every opening towards the south, making "exact surveys" of every channel that appeared to be navigable.

The 6th, 7th, 8th, employed in reducing the Original Surveys to smaller Scales and copying the Journal to send to the Governor. During this time we had much rain. Employed some Carpenters to stop ye Budgarow's Leaks, & repair the rudder....

The 10th in ye Morning dispatched a Hircar[5] with ye Maps & Journal[6].

On June 24th he left the Ganges at a point about 25 miles below Pābna[7] to explore a big creek[8] running in a south-easterly direction and connecting with one he calls the "Burrasaat"; he notes in one place that "the Banks being mostly covered with Jungle we have very troublesome Work to survey them", and on July 20th he writes,

It will now appear by our Observations that the Burrasaat is the West most of the navigable Creeks which run out of the Ganges to the Eastward of Jelenghee & is therefore likely to afford the shortest Passage to Calcutta; but being at present destitute of Cash to pay ye People, or proper Boats to survey Sunderbound[9] with; besides it being now nearly the height of the wett Season, we are very apt to be deceived in ye depths of Water. ... I have therefore judged it proper to go to Dacca to get a supply of Cash & larger Boats[10].

They reached Dacca on August the 4th, and after six weeks silence the journal re-opens,

The 19th of September 1764, being pretty well recovered from my Indisposition, I set out from Dacca in the forenoon in order to proceed with the Survey of the great River.

By the 25th he reached "Saatpour"[11], at the head of the creek where he had left the Ganges three months before;

There had been so much of the Bank carried away by the Freshes, that we hardly knew the place again; & could not have found the Mark out, had it not been for a remarkable Tree which I formerly took ye bearings of. ...

15th October.... Received a letter from the Governor by 2 Hircars, & answered it immediately, inclosing a Sketch of the River from Saatpour to this Place. In Mr. VanSittart's letter he approves my Intentions of surveying the River on both sides, having before omitted to explain whether it was to be so surveyed. ...

The 25th at the time of finishing the Survey... I found myself very ill of a Cold, which was followed by a Feaver; & being in the neighbourhood of Dacca, I thought it proper to go there for Assistance. ...

My Disorder increasing I remained at Dacca till ye 2nd November when being tolerably recovered I set out from thence to proceed with the Survey. ...

[1] *Budgarow*, a houseboat; *Willock*, a smaller boat. [2] La Touche (9–13). [3] Orme MSS. Vol. 7; copy of Journal in Rennell's handwriting; differs slightly from La Touche. [4] La Touche (13). [5] *Harkara*, a messenger. [6] ib. (16). [7] 78 H/8. [8] Now the Garai R. [9] *Sundarbans*, the forest-covered delta of the Ganges. [10] ib. (22). [11] 79 E/5.

Whilst at Dacca I wrote to Mr. VanSittart informing him of my illness, & of the late Progress of the Survey inclosing a Sketch of it. At the same time I requested his Opinion of the utility of surveying the Baramputry or Megna from its conflux with the Ganges to Dacca. He was pleased to express his approbation of it.[1]

In Rennell's time the junction of the Ganges with the Meghna[2] lay well below Lakshmīpur,[3] and nearly 80 miles south of Dacca, and Rennell now continued his journey southwards down the Ganges through typical Sundarbans country;

We have no other Obstacles to carrying on our Business properly than the extensive Thickets with which the Countrey abounds, & the constant dread of Tygers, whose Vicinity to us their Tracks, which we are constantly trampling over, do fully demonstrate. ...

We now proceeded along the Western Shoar of the Megna NBE[4] & NNE, a confused cluster of uninhabited Islands forming the East side of the Passage. Between some of these Islands I could discover no Land at all, it appearing like an Open Sea. ...

The 20th in the Morning...had a view of Luckypour, the Factory being distinctly seen 13 or 14 miles. Before noon we reached it. ...

The 22nd in the Morning we set out from Luckypour, on our return to the Survey. [This visit being by way of reconnaissance.] ...

The 30th received a new Budgarow from Calcutta. It has been 31 days on its Passage. Being a new one it will be rather safer than the one I had before, as that was old & ready to drop to pieces, but this one seems to be very crank & dangerous. ...

The 14th [December]...at Noon came to the Point opposite Luckypour from whence we crossed over in the afternoon. The Megna seems to be about five miles over. ...

The 16th began to make an exact Survey of the Nulla, Fort & Village of Luckypour. ... The 20th having finished the plan, took y^e^ Latitude of the Place by Hadley's Quadrant, but the Horizon was not good enough to place any dependance on the Observation [152, 222]. ...

From this time to y^e^ 23rd employed in finishing y^e^ Original Maps, copying others, & making a small Map of the Ganges which was immediately dispatched to the Governor. Began likewise a compleat Sett of Maps of the Ganges on a scale of 2 miles to an inch[5] [223]. ...

The 2nd [January 1765] in the Morning set out for Luckypour in our way to Dacca, where I must proceed in order to get a supply of Money. Nothing remarkable happenned in our Passage ...

[Marginal note]. The 6th in y^e^ Morning one of the Sepoys was taken off by a Tyger from y^e^ Northwest part of Daokytya Island, he having stept ashore out of a Pulwar[6].

Having got his money Rennell now returned to survey both banks of the Meghna, and lastly the "Beurygonga, or River on which Dacca is situated", and closing work at Dacca on March 3rd completed his maps before starting his survey of the Brahmaputra.

The 28th March sent the Governor a general Map of the Megna on a scale of 2 Miles to an Inch, & the 4th April sent y^e^ remaining 8 Maps of the Ganges; there has now been sent a compleat sett of Maps of the Ganges, both general and particular.

The 5th April received Orders from the Governor to survey the Megna or Baramputrey from its conflux with the Issamutey to Gaulpara[7], or as high as it can be done without offending the Natives. ...

The 6th [May] received intelligence of Lord Clive's arrival at Calcutta[8] [22]. ...

Thursday May 9th set out from Dacca in order to survey the Baramputrey, & proceeded by way of the Issamutey River. ...

The Western Bank of this River harbours a great number of Snakes, amongst which there are some of an enormous Size[9]. June 3rd came into the great Baramputrey. ...

This Day [July 14th] we were obliged to leave off surveying, by reason of the Rivers suddenly overflowing the Banks, & rendering it impossible either to measure Station Lines, or to note the exact bed of the River. ...

From the 14th to y^e^ 19th of July, employed in tracing y^e^ Baramputrey from Baganbarry[10] to Chilmary[11]...The distance by Estimation is near 70 Miles, & as I was assisted in ascertaining it both by the bearings of the Mountains & the Latitude of Chilmary, there can arise no very considerable Error. ...

The Chain of high Mountains...that are said to be the Eastern Boundary of Bengall begin about the Latitude of 25° 10′N and run in a curve line to the Northwestward. ... I have not

[1] La Touche. (25–30). [2] The Brahmaputra takes this name after being joined by the Meghna from Sylhet. [3] 79 J/13. [4] North by East. [5] ib. (32–4). [6] *Pulwar*, a small boat. ib. (36). [7] Goalpāra, on Assam frontier, 78 J/12. [8] ib. (41–3). [9] cf. Reuben Burrow [158]. [10] now Mymensingh, 78 L/5. [11] Chilmāri, 78 G/10.

yet had an Opportunity of taking their exact Altitude, but judge they are near a mile & half in perpendicular Height[1].

In the accompanying General Map, only one of the Mountains is placed in its true Situation,... the others by reason of the very frequent thick weather were not seen from the South end of the Base, & therefore their Situation must be left undetermined till ye dry Season.

From the 19th to ye 25th July staid at Chilmary, during which time we were employed in taking ye Latitude, getting Information from ye Country People, & constructing a Sett of General Maps[2].

Rennell now broke off survey and spent the rest of the rains at Dacca, where he received Clive's orders for the complete survey of Bengal [22].

As his Lordship was pleased to leave it to my Discretion where to begin my Surveys, I judged it most proper to proceed with the Survey of the River Baramputrey, & the Countries that lie contiguous to it.

Sunday 13th [October 1765] set out from Dacca. The Rainy Season not broke up but expected to break at the new Moon which was to happen ye next day. Being to go by way of Naranda Creek I judged that no ill Consequences could happen to the Boats by the Monsoons breaking, whilst they continued in so narrow a Creek; the Weather also appeared to be settled. ...

The Courses of the River are various, being from SW. to East; however the whole distance is chiefly meridonial, & therefore easy to be corrected by the Latitudes [152]. By this Base I was unabled to fix the Situations of several of the Sosong Mountains[3] which in clear Weather will serve as Marks 80 miles off. ...

Being entirely ignorant of the Situation of Rungpour[3], & the adjacent Countries; the knowledge of which would enable me to regulate my Route after the Survey of the Baramputrey was finished, I judged it proper to trace the Roads to that Place...That 10th of November entered the Teesta Creek[4] & proceeded up it towards Olyapour[5] which lies in the Rungpour Road ...

From Olyapour we proceeded towards Rungpour by Land, there being no Water Passage at this Season. ...

There is but little worth remarking about Rungpour, it being only a principal Gunge, & like most of the others, the Houses are built of Matts & Bamboos, there being but one Brick house in the Town. ...

We arrived at Rungpour the 14th...From the 16th to the 19th employed in tracing the Roads from Rungpour to Gurygong[6]. ... In our Route we crossed the...Teesta Creeks, besides several Jeels which render the Roads impassable 6 months of the Year[7].

They rejoined the Brahmaputra on November 21st and continued up towards Goālpāra, passing the mouth of the Manās[8];

As this River affords so short a Passage to the Boutan Mountains... there is no doubt but that any Number of Firr Trees may be brought down by it, if a right understanding subsisted between our People & the Assamers; as I have myself seen a large Firr Tree which floated down the River, after being washed down the Mountains by the Land Floods [23][9]. ...

The Assam Countrey begins from the Bonaash River on the North side the Baramputrey & one of their Chokeys is placed directly opposite Gwalpara; but on the South side the Bengall Provinces continue for upwards of 21 miles.

The Woods abound with several kinds of wild animals, as Tygers, Rhinoceros, Buffalos, Elephants, &c., the tracks of which may be seen everywhere. ...

From the 2nd to ye 6th December employed in tracing the Baramputrey from Gwalpara to the Frontier of Assam on the Southern side. The distance by ye River is 22 miles. ... We were not permitted to land on the Northern or Assam side, all the way, there being several Chokeys placed; however we found means to lay down about 10 miles beyond the Bengall Frontiers, & in returning we coasted the Assam side near enough to inform ourselves of all the particulars which we wanted[10] [78–9].

Between April 1764 and December 1765 Rennell had thus completed a detailed survey of the Ganges from Jalangi to the sea, and of the Brahmaputra from the sea to more than 20 miles above Goālpāra, besides many important side streams.

[1] Gāro Hills, 78 K; highest point 4652 ft. [2] La Touche. (44–8). [3] Rangpur, 78 G/5. [4] In Rennell's day the main Tista R. flowed down the Atrai R, changing towards Chilmāri in 1787. [5] Ulipur, 78 G/10. [6] Kurigrām, 78 G/9. [7] ib (51–5). [8] 78 J/11, 15. [9] In a letter home, 30–8–66, he writes, "The ridge of mountains which separates Bengall from Thibet is covered with Firs and Pine Trees; so that in a few years we shall be able to mast all our Ships with Pines". H.M.S. 765. [10] La Touche (57–8).

Much of the work of himself and his assistants during the next five years covered the survey of the major waterways; in particular, Ritchie surveyed the Madhumati[1] from the sea to the Ganges, whilst the Ganges was surveyed below Rājmahāl by Rennell himself; from Rajmahal to Monghyr by Richards; from Monghyr to Patna by De Gloss, and from Patna to Kanauj[2] by Huygens.

Rennell's detailed river surveys of 1764–5 are still preserved, both in his *Bengal Atlas*[3], and in the *Companion Atlas*[4] [226–30], whilst early MS. copies are numerous.

Rennell's surveys of the Bengal rivers will always be of interest for the study of changes of detail along their courses; many references to these are made by Colebrooke thirty years later [64–5], and in 1828 Mr. May, then "Supervisor of the Nadia Rivers" asked for Rennell's surveys of the Ganges, below the head of the Jalangi, in order to study such changes[5].

Major changes are less frequent, as is pointed out in an interesting comparison, made by the Survey office at Dehra Dun in 1934, between Rennell's surveys and in the modern maps of the 1/2M Southern Asia Series;

> Using the chief towns as ruling points [the maps] were found to fit very well with very little adjustment. ... The only material changes are in the three large rivers, the Kosi, Tista, and Brahmaputra.
>
> The Kosi has shifted considerable to the west, the Tista to the east, and the Brahmaputra now has its main branch down a previous minor branch on the west, but the old easterly branch still functions as a minor branch[6].

MIDNAPORE & BURDWĀN, 1761–6

As may be seen from D'Anville's map of 1752 [pl. 13] little was known of the geography of Bengal in 1760 when the Company obtained possession of "the provinces of Chittagong, Burdwān, and Midnapore" [1][7].

The earliest English maps are rough sketches of parts of Midnapore and Burdwān which appear to have been made between 1760 and 1765. Orme records a map entitled "Knox's Roads in the Midnapur Province"[8], whilst Rennell makes use of a map of that area "the author's name unknown"[9]. There are still preserved in Calcutta two old maps of Midnapore on the half-inch scale[10], which may contain "cursory" surveys by Dennis Morrison of "part of the Balasore province" and of roads in parts of Midnapore and Burdwān[11], which Rennell used in the map he gave Lord Clive in January 1767 [24]; they probably also include the surveys made by James Nicol under the orders of Ranfurly Knox, who

> was always assiduous in making himself master of this useful knowledge; with this view, when he commanded in the province of Midnapore, from the end of the year 1761 to July 1763... he employed Mr. Nicol, an active officer under his command, to survey the province. Mr. Nicol went as far as Balasore; ...he surveyed the mouth of the Piply River[12].

Another map of this period is entitled "*A Map of Part of the Kingdom of Bengal*, drawn from surveys made in the year 1762 and 1763"[13]. This map covers the whole country from Balasore northwards to the Ganges, and from the Hooghly and Cossimbāzār rivers westwards to the hills, and is a skeleton map compiled from surveys along the main roads and rivers. This is possibly Polier's map from which Rennell, in 1765, took "the Hooghly and Jelenghee Rivers together with that part of the Ganges which lies to the westwards"[14] [222]. How much of this was surveyed by Polier himself, we cannot tell.

In February 1765, "being much in want of another person Well qualified to assist in making the different Surveys of the Country", the Council appointed

[1] 79 I, F. [2] 54 M/16. Benares to Kanauj, 1765. Orme MSS. 65 (30). [3] *Ben. Atlas*, XIV to XX, XXIII. [4] See alse *Imp. Lib*; IO. Maps. & MRIO. [5] See also *Report on the Rivers of Bengal*. 19–2–1857. Capt. W.S. Sherwill. *Ben. Sel.* X. 1908; also John Marshall (31–2). [6] GBO. 42. C.4., 1934 (19). [7] By treaty with Mīr Kasim, on his succession as Nawāb of Bengal. BSCC. 27–9–60 & 6–11–60. [8] Orme MSS. I34 & 135 (89, 93). [9] Note on map xiv, *Companion Atlas*. [10] *Imp. Lib. M & P.* 352, 379. [11] Orme MSS. XI (3006). [12] Subarnarekha R., at one time thought to be the W. mouth of Ganges *As. R. XIV* 1822 (462); Caraccioli (337). [13] *Imp. Lib. M & P.* 351. [14] La Touche (49).

"Mr. Lewis Du Gloss...an additional surveyor"[1]. After surveying the Cossimbāzār River [17], he was ordered "to survey the Midnapore & Burdwān Provinces & Pargannas, as also the course of the Mohanaddee River"[2].

De Gloss made "exact surveys" in various parts of Burdwān and Midnapore,[3] but most of his time was spent on surveys of the rivers and embankments, and on schemes for controlling the floods, and this matter was found so important that Plaisted was called up from Chittagong to assist him, at the request of Mr. Verelst[4].

During 1765 the Directors wrote out, twice, pressing for maps;

You are to transmit to us as soon as possible, exact Plans of all the Lands granted to the Company, as well those in the Environs of Calcutta, as in the Provinces of Burdwan, Chittagong, Midnapore or elsewhere, accompanying the same with such Remarks and Explanations as may be necessary to give us a full and satisfactory Information of all our Possessions, their value, and the Importance they are to the Company[5] [250].

and again,

Much remains yet to be done before we can be convinced that we receive the full value of the Revenues of the Province [Midnapore], therefore we direct you to be very full in your information...and you must send us a Plan of the Bengal Frontier towards Orixa, with your opinion for the best means of preventing Invasion on that side[6]...

but soon after this reached India, De Gloss was called away to survey the frontiers of Bihār, and other officers took up the work in Midnapore [28].

RENNELL & RICHARDS, 1765–6

In May 1765 Clive had come out to Bengal for his second term of office [19], and Rennell writes,

The 10th October whilst at Dacca I received Lord Clive's Orders to set about forming a general Map of Bengall with all Expedition; & as it appeared to be a very tedious Work should all the Distances be exactly ascertained, his Lordship gave Directions that they should be taken in a cursory Manner only, correcting them by Latitudes or any other eligible Means.

This order at once raised Rennell from a mere surveyor of rivers to be the geographer of a vast unsurveyed country, and it is interesting to trace the origin of Lord Clive's wish.

Robert Orme, the historian, had settled in London, and was finding difficulty in abstracting from the India House material for his second volume. In a letter to Clive, dated November 21st 1764, he speak of these difficulties, and continues,

You, my Lord, have treated me differently; and pray continue to do so. Make me a vast map of Bengal, in which not only the outlines of the provinces, but also the different subdivisions of Burdwan, Beerboom etc., may be justly marked....Take astronomical observations of longitude, if you have anybody capable of doing it. I send you a skeleton of the Bengal map I intend for my second volume...[8]

to which Clive replied, Calcutta, September 29th, 1765:

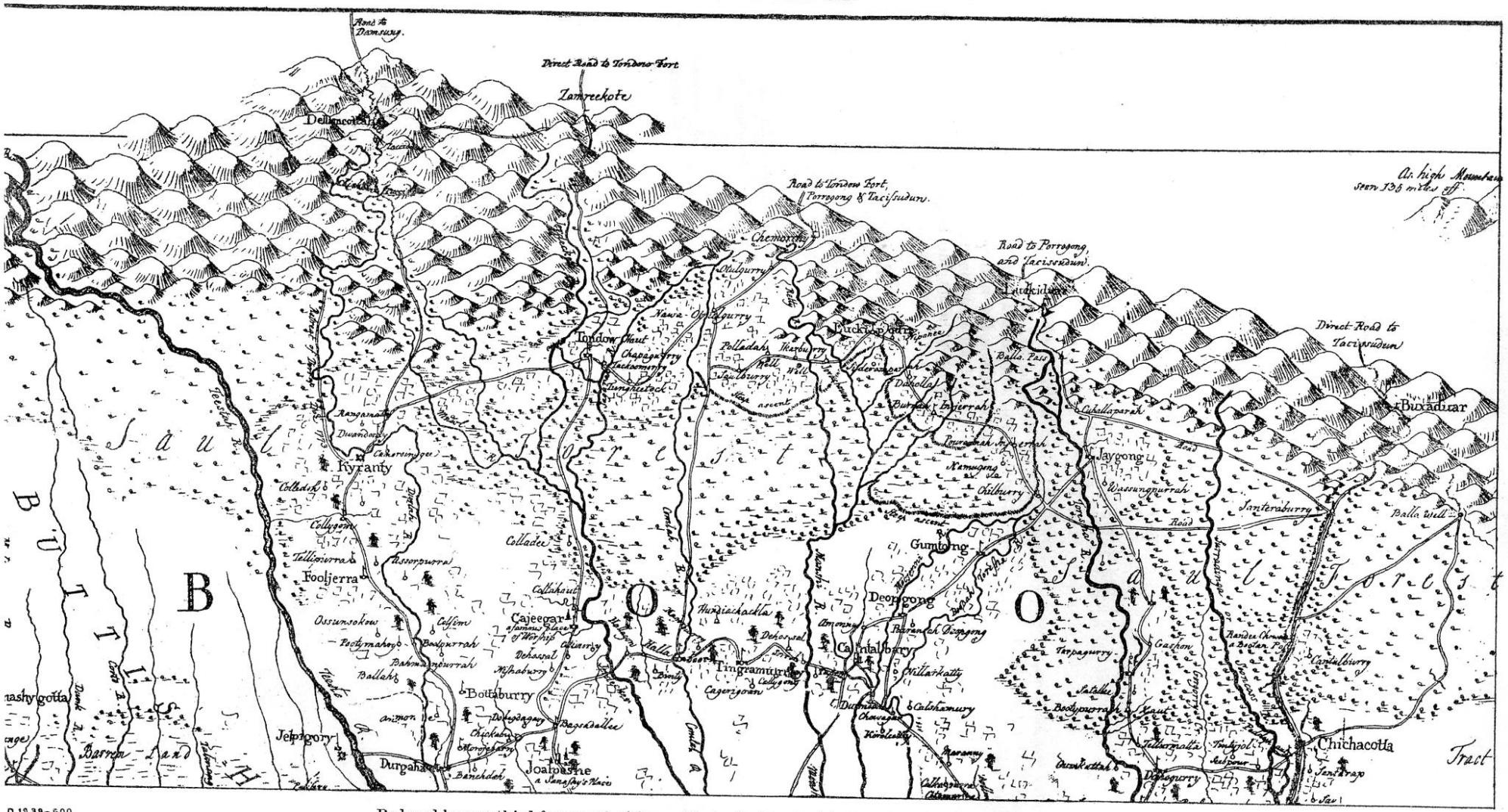
I am preparing plans in abundance for you. You shall have very exact charts of Bengal, Bahar, and Orissa, and of the Mogul Empire as far as Delhi at least. A map of the Ganges likewise, and all the other rivers of consequence[9].

At Clive's wish Rennell was given an assistant [269] and records that as he was returning from the Assam frontier,

On December 11th Ensign Richards with a Detachment...joined me, and on the 12th we set out by Land to survey the countries between the Bonaash River and Rangamatty[10] [32]. ...

[1]BPC. 19–2–65. [2]The Mahānadi R. flows thro' Cuttack, 150 m. south of Midnapore, far beyond De Gloss's area. [3]Orme MSS. XI (3006). [4]Henry Verelst, Writer *c.* 1750; Chief at Chittagong 1761–5; in charge Burdwān & Midnapore 1765–6; Governor 1767–9; d. 1785; *DIB*; BSCC. 28–10–66. [5]CD to B. 15–2–65. [6]CD to B. 24–12–65 (54). [7]La Touche (51). [8]Malcolm II (523). [9]Malcolm, III (133). [10]Manās R. 78 J/11, 15; Rangāmāti, near Dhubri, 78 F/16. [pls. 13, 14].

On the BHUTĀN BORDER



D.13.39-600.

Reduced by one-third from part of Rennell's 5-mile *Provincial Map No. VI* which appears as Plate 44 of *Companion Atlas*

Published at S.I.O. Dehra Dun

This area falls in modern maps 78 B & F.
Surveyed by Rennell and Richards, 1765–68 and Martin, 1772–3 [23,32-3,35]
Note that Rennell here makes no attempt to indicate Longitude.

We entered the Boutan Countrey...& crossed about 7 miles of it. ... I had some thoughts of proceeding...but finding theNati ves very averse to it, ... I judged it prudent to desist without further orders, as being foreign to the Service now in execution. ...

We arrived at Gurugong[1] the 30th, & the next day being the last of the month I discharged all the boats except the Budgarow & Pulwars, having now no farther Occasion for them[2].

They now surveyed a line across the north of Rangpur district, and Rennell writes,

I went so far to the westward as the Purranyah[3] & Morung[4] Countries, and have now finished the North Limit of Bengal from Assam to Morung, which is near 3 degrees of Longitude. The borders of Bengal are from 26° to 26° 30′. ... Assam lies to the NE and some independent Provinces & Boutan[5] to the N.

The Boutan Mountains begin in 27° & are so high that they may be plainly discovered 120 miles [76]. A great number of Rivers have their source from thence; some falling into the Burrumputry, others into the Ganges[6].

They left Rangpur on January 22nd, marched northwest and crossed the main Tista some 30 miles south of Jalpaiguri[7], where Rennell notes

We perceived pieces of different kinds of Trees lying on the Sands in the River: these the Countrey People informed me are brought down from the Boutan Mountains by the Freshes: amongst many other kinds of fine Timber I perceived the stump of a Firr Tree of which I brought away several pieces[8] [20].

They came to the Mahānanda River at "Sanashygotta"[9] finding the latitude to be 26° 33′, and after surveying the boundary towards Murang worked down the Purnea side of the Mahānanda to "Maha-Raage-Gunge"[10]. From here they returned eastward, and recrossing the Tista at "Nabobgunge",[11] surveyed the boundary between Rangpur and Cooch Behār.

On February 20th, 1766, near the southmost point of the borders of Cooch Behār, they fell in with a small force of sepoys engaged with a band of *sanyāsi* Fakirs;[12] Rennell placed himself and his men at the disposal of the commander, and in the fighting that followed his Armenian surveyor was killed, and he himself most shockingly wounded; he was with difficulty conveyed to Dacca and was fortunate to get through alive [292].

I stayed at Dacca till the beginning of June for the recovery of my Health & then set out to survey the Countrey between Luckypour & the Fenny, in order to join on Mr. Verelst's March to Cospour to the General Map of Bengall. [82]. Ensign Richards was sent in the beginning of May to finish the survey of the Curesa River & the Rangamatty Countrey[13].

Rennell worked through Comila and Noākhāli to Chittagong, returning to Dacca at the end of July;

As Mr. Plaisted is said to have surveyed all the Coasts & Islands betwixt Luckypour & Islamabad, I forebore setting about surveying them, as well to prevent double Trouble & loss of Time, as that the Season of the Year was improper for it [14]. ...

None of the Hills exceed the height of 240 yards, & of these Sittacoon[14] is the highest situated about halfway between the Fenny & Chittagong[15].

After completing the survey that had been interrupted by the encounter with the *sanyāsis*, Richards surveyed the main Tista through Dināpur[16] towards the Ganges, and joined Rennell in Dacca for the rains.

The 4th November [1766] set out from Dacca to survey the Northern Branches of the Ganges. The Dullaserry[17] was surveyed in 1765 from its conflux with the Megna to the Beurygonga[18] & we now proposed to go on with the Survey of that & its principal Branches first. ...

We were employed on this Survey till the 28th...when we came into the great River by way of Pubna[19]. ... The river has a very serpentine Course, the distance through being upwards of 53 miles, whereas the Horizontal distance is not 28.

[1] Kurigrām, 78 G/9. [2] La Touche (59–61). [3] Purnea Dist. 72 N, O. [4] Murang Dist. Nepāl, 72 N. [5] The name Bhutān was generally applied to Tibet till after Bogle's mission [74, 223]. [6] Orme MSS. 54 (113). [7] 78 B/10. [8] La Touche (68). [9] Sanyāsikāta. 78 B/6. [10] now Kishanganj, 72 N/16. [11] 78 B/11. [12] near the present Gitaldāha Ry. Jn. 78 F/8. [13] The area of the catastrophe. La Touche (74–5). [14] Chandranāth, near Sitakund, 1155 ft., 79 N/10. [15] ib. (76–7). [16] 78 C/10. [17] Dhaleswari R. 79 I. [18] Burhiganga R. 79 I/6. [19] Pābna, 78 H/8.

They then spent some weeks surveying the rivers and swamps on the Pābna-Rājshāhi borders through which the old Tista found its way to the Ganges;

Between Boutan & Raage Gunge it is named the Teesta, from thence to Bandgotta the Attri; between that & Cullum the Gole Nuddy; and afterwards the several names of Baganuddy, Ballaser, & Currumjar.

Mr. Richards had surveyed the River from Raage Gunge[1] to Cullum as before-mentioned, but for want of an instrument for taking the Latitudes the latter part of the Survey was not sufficiently exact; for this reason we proceeded up the River & took the Latitudes as far as was necessary. We finished the Survey as far as Cullum the 9th December ... The last Observation was ... near Conchon, the Latitude of which was 24° 53′ N.[2].

They also surveyed the eastern limits of the Radshy Province in order to make Lord Clive's Map as compleat as possible before his leaving Bengall. ...

All our leisure Time since we left Dacca has been employed in compiling a general Map for Lord Clive. After all the Observations that we could make before his Lordship's setting out, the Map would remain very imperfect without we were supplied with Copies of several Maps from Calcutta, & it being too late to wait for these, I determined to go to Calcutta as soon as the survey of the above-mentioned River should be compleated.

We had not Time to survey the Currumjar River as I intended, by reason of the sudden departure of Lord Clive. We left Sajatpour[3] and proceeded for Calcutta the 20th December. ... The 30th in the evening arrived at Calcutta. We had been employed on the Map the whole passage.

From the 30th of December to the 6th Feby. inclusive stayed at Calcutta. The greatest part of the Time, we were employed in compiling and copying Maps for Lord Clive[4].

Clive's health had broken down, and he left Calcutta, a sick man, on January 29th 1767[5].

BIHĀR, 1766–8

In 1763 war broke out between the English and Mīr Kasim, Nawāb of Bengal; the Nawāb retreated to the west of Patna, and obtaining the support of the Wazīr of Oudh and Shāh Alam, the exiled Emperor of Delhi[6], made stand on the Karamnāsa River[7], till the English won a decisive victory at Buxar on October 23rd 1764.

On Clive's return to Bengal the following year, he promptly went up-country and came to a settlement with the Emperor and Wazīr, and obtained for the Company the *dewāni* of "Bengal, Bahar & Orissa[8]", besides the Northern Circārs and the Madras *jāgīr*.

The Company had now a long frontier from Balasore on the south, through Chota Nāgpur and Rāmgarh, to the Karamnāsa River on the west, through completely unknown country and unknown peoples; with the Marāthas always pressing towards the rich country of Bengal. The Council became anxious about the protection of their western frontiers, and in September 1766 wrote to the C. in C. Colonel Richard Smith[9];

In consequence of a resolution taken sometime since, of making a thorough survey of the Roads in the province of Bahar[10], we have despatched Captain De Gloss to you for that

[1] Rājganj, suburb of Dināpur, which Rennell spells *Denospour*. [2] 78 H/3 see *Ben. Atlas*, VI & XVI. [3] Shazadpour on sheet (vi) of *Ben. Atlas*. 78 H/12. [4] La Touche (82–4). [5] Clive took his own life on Nov. 22nd 1774. The following is an extract from a letter from Patrick Ross, CE. Madras, to William Stevens, telling him the news, possibly distorted! "The Europe Ships are arrived and bring us the account of a new Parliament, and that the Americans continue refractory. Lord Clive, they say, has put an end to his existence by thrusting a paper scraper into his throat. The Duke of Athol has drowned himself in the Tay, and Lady Effingham has burnt herself; others say her Fate proceeded from accident. Whichever it be, God preserve us from such an end." Mack. MSS. LXVIII. 28–6–75. [6] Succeeded Alamgir in 1760; returned to Delhi 1771; eyes put out by Rohilla Chief 1788; d. 1806. [7] Called "the accursed river" by Hindus; joins Ganges from SW., 64 0/14, 10 m. W. of Buxar. [8] Midnapore had been part of Bengal from 1706; Orissa had been granted to the Rāja of Nāgpur in 1751, under whom it remained till the war of 1803–6. Wills (27 n). cf. *Memoir*, 1793 (cxiii) & *Imp. Gaz.* Ben. I. (301). [9] Called "the Nabob of Nabobs", Holzman (74–5). [10] Covered the present districts of Patna & Gaya.

purpose; and as we understand that Captain Claud Martin[1], is well versed in the Business of Surveying, you may employ him likewise upon the same undertaking, which we wish to see concluded with all possible despatch & accuracy.

It is certainly of great importance to our security that we obtain a perfect knowledge of the Inlets to Bengal. For this reason Captain Huygens has our orders to examine the several passes into the province from the Hills of Tilliagurry[2], quite down to Midnapore; to assist in which we desire you will immediately dispatch Ensign Carter from Monghyr[3] [26].

De Gloss has left a journal[4], which gives such a vivid and interesting account of his survey that the following extracts seem worthy of print. He took four European assistants with him [283].

28–9–66. Received orders from Lord Clive to proceed to Patna, and follow the instructions of Colonel Richard Smith. ... Left Calcutta that evening. ...

27–10–66. Joined Capt. Huggins of the Engineer Corps and Surveyor ... a few coss from Raujmall[5]. ...

2–11–66. Parted company with Capt. Huggins who was proceeding to Gongerpersaut to begin is survey [*sic*] ...

10–11–66. Reach Monghere[6]. ...

18–11–66. Reach Patna. Budgeroe & Boats remaining Patna, report to Colonel Smith on 19th. ...

23–11–66. Received one company of sepoys, 6 Cavalry, 20 Burgundasses, and 5 Harcarras from Government for the use of the Survey, with following instructions from Col. Smith.

Headquarters at Meer Aboyls. 25–11–66. ... to proceed on Survey of Part of the Bahar Province ... to commence surveying at Doudnagore[7] taking your route to Gautolly upon the Zoane[8], and from thence to Rottasgur ..., continue your survey along the Banks up the Zoane, until you come to the Range of Hills that lays to the SW. ... or as high up the Zoane, as you can proceed with safety. When this is accomplished you will survey along the range of Hills Eastward until you come to ... Bahar[9], examine well if there are any passes thro' the Hills, until you come opposite to Mongheer. ...

The principal object of your present Survey is to obtain information of every Pass or Entrance into Bahar Province from the Westward & to acquire some knowledge of the different Roads, Rivers, and Principal Towns with their Bearings & Distances. You are to keep a daily journal. ... On your arrival at Mongheer you will receive further orders.

25–11–66. Left Patna.

28th. Arrived at Doudnagar, near R. Zoane.

29th. Began the Survey. ...

15–12–66. Found it impossible to continue the Survey any further by the Impracticable Junggles etc. [no road or pathway]. ...

19th. Employed surveying the mountainous Hill of Rottasgur[10], together with the Fort.

20th. In the course of Survey found the country much embarassed with junggles and immense Quantity of Tygers with great plenty of Deer, Peacock, and other game.

21st. Surveying along the Zoane altho' attended with the utmost Trouble, difficulty, and fatigue, being obliged to cut passes thro' the junggles for our Proceeding forward & observations, yet could not proceed above one coss and a half each day. ...

25th. Halted at Berealpour on account of the Jungles, the bildars employed clearing them away to make a pathway. Met with several armed people in the Thicketts where they reside, having Bows & Arrows and Cutlashes, but on our appearing in view made off, as also the village people, forsaking their Habitations, which much distressed we for want of supply of Provisions. ...

26th. [The party is fired at during this day & night] ... Saw the Track of Rynosserus is feett.

27th. ... Came to the village of Pushduree with immense fatigue & trouble owing to the Junggles; found several bullocks etc., that had been devoured by the Tygers where are also great numbers of Bears, one of which, with here cubs attacked a Lascar who narrowly escaped falling a prey by mounting a tree & on his calling for assistance, which was immediately given, the Bears took another Road in the Thicketts. ...

[1]Martin was at this time involved in the "Batta Mutiny" and does not appear to have joined in this survey. [2]Teliagarhi Pass at N. end of Rājmahāl Hills, 72 0/12; "At about a league on this side near a place called Teria-galli, the road is shut up by a gate or barrier, which they only open occasionally, and is guarded by soldiers. The rest of the road is so narrow that you cannot travel but just by the brink of the Ganges." Father Boudier, 1734; Herbert (28); see also Hodges (24). [3]BSCC. 23–9–66. [4]Orme MSS. Vol. 9; note the weakness of his English. [5]Rājmahāl, 72/16. [6]Monghyr, 72 K/7. [7]Daudnagar, 72 C/8. [8]Son R. joining Ganges, 72 C/14. [9]Bihār, 72 G/12. [10]Rohtās, 63 P/14.

1–1–67. [Leaves the Son & surveys along the "Cole" R[1].]

2nd. [Surveys with less difficulty than along the Son].

3rd. ... Surveying on the sand of the River Cole where myself and horse was much embarassed on the Quicksands, the horse with difficulty saved[2]. ...

8th. [Returned to Rotasgur, and now carries his survey eastwards along the Hills.]

27th. [Cross road leading to Pallamow[3].]

12–2–67. [Reaches Gayah; described.] ...

26–3–67. Enters the Ramgur[4] Country. ...

3–4–67. [Takes an observation for variation of Compass.] ...

8th. Employed surveying & on the Drafts. Received advice per Harcarar that Lieut. Carter, & Mr. Cameron[5], & Russell were on Survey with 3 companies of Seapoys.

9th. Received a letter from Mr. Carter. ...

17th. Came to Soubah Bahar. ... Most of my people fell sick with fevers & Fleux, thro' the immense Heat of the Wether & many deprived of sight by the Hot Winde. Was obliged to Halt & employ a Doctor to attend & give them Medicines, as also my assistants equally indisposed, but during which time surveyed & employed on the Drafts. ...

[From May 12th to 27th, left most of his men and baggage in Bahar, and surveyed round the *parganah*; returned to the *soubah* "finding my assistants & people violent ill with fever".]

[During June & July continued Survey, with interruptions from the Rains.]

July 11th came to Mongheer.

12th. [Went to wait on the C.O. of the Garrison], ... letters waiting for some months from Governor Verelst & Colonel Smith directing me to proceed to Benares et Allahabad.

Camped at M. and made fair copies of maps for the Governor. ...

August 20th. Employed constantly on the Drafts & reducing it to a small scale, agreeable to the Governor's direction, as by Letters received from Captain Reynells[6] for so doing.

De Gloss now received orders for a survey of the Gandak River, the Council having appointed one of the Company's servants ... to examine the River Gandak and report on Fir Trees from Butea[7] country, and being of opinion that it would be of great use to the Public if we could be supplied with Fir Tree Timbers by means of the River Gunduc which empties itself into the Ganges opposite Patna, ... direct the Gentlemen[8] at Patna to ... apply to the Commanding Officer for a Surveyor to survey not only the River but likewise the Nullah that runs close to the Fort of Battea[9], also to give directions for some of the largest Trees to be sent down to Calcutta [20].

De Gloss had to wait several days because all available boats had been requisitioned for Colonel Peach's brigade which had been ordered on service to the Circārs [91], and embarked for Calcutta on October 13th, on which date De Gloss departed from Mongheer, crossed the Ganges, surveyed the Rocks, River & Islands opposite the Fort. ...

October 16th. Hired boats which had been sunk in order to avoid being pressed for transport of the Brigade. ...

18th. Continue survey along north Bank of Ganges River noting the Limits of the Pargannas. ...

26th. Departed from the village Piprah[10] & and met with equal Difficulty on account of the high Reed Junggles.

Saw the Track of Tygers, Wild Buffaloes, and the Rynosseroces; two of the latter of which as Informed was caught last season in the said place by a Trap particulatly Invented for that Purpose. ...

November 5th. Met the Ganduk River emptying itself in the Ganges with extreme rapidity, the sands of which shifting and in constant motion forming whirlpools so rolling and essuing forth in that manner when least expected ...

November 8th. Hodgepoor[11]. Waited on Mr. Rumboldt, who insisted on my handing in my seapoys who were required for collection of Revenues. ...

10th. Allowed 20 seapoys belonging to the Calcutta Garrison, and returned those from Mongheer. ...

[1] Koel R. joins the Son 63 P/14. [2] A common experience on these rivers. [3] Palāmau, 73 A/1. [4] Rāmgarh 73 E/10, 30 m. south of Hazāribāgh. [5] Probably John Cameron, Engrs. [6] Rennell had become S G. from 1–1–67, and De Gloss was under his professional orders. [7] Bhutān [23 n. 5]. [8] the Provincial Council. [9] Bettiah, 72 B/5. [10] 72 K/3. [11] Hājīpur, 72 G/2.

15th. Surveyed and came to Patna. ...
27th. Return to Hodgepoor, still surveying. ...
December 9th. [Surveys the Ganduc.] ...
16th. Small scale drafts Mongheer to Patna to Governor Verelst.
17th. Surveying. ...
25th. Halt for Christmas.
26th. [Continues surveying the Ganduc.]
30th. [Surveying towards Bettiah.[3]]
January 1st 1768. Halted for the New Year Day. Was suddenly indisposed by a fever & Pleurasy in my side. ...
8th to 12th. Bettiah. ...
23rd. [Is warned to expect opposition from a local Rāja.] ...
26th. [Meets an armed body of 200 men which disperses on his approach.] ...
30th. Letter from Governor Verelst ordering me to decline the further Course of Survey & Immediately ... to Proceed downwards for Bankapoor[4] Cantonments, agreable to which did so comply. ...
February 14th. [On journey down the Ganduc]. Heavy rain & sudden squalls of wind by which lost one Boat on the Quick Sands, wherein was Boxes of Instruments, Books et other Necessaries etc., great part of which could not obtain as the Boat entirely Bilged & sunk et Buryed in the shoals & Budgrowse and other Boats in equal Danger, so that could not proceed but obliged to lay at a Sand Bank.
15th. Came to Hodgepoor at which place found Ensign Richards, Surveyor. Wrote to Governor Verelst. ...
18th. Came to Patna. ...
March 1st 1768. Submitted drafts of the Gunduc River, with abstract of Journal to Governor Verelst.

De Gloss was now placed on other duty, and not again employed on survey. In the 17 months since he had left Calcutta, he had travelled up the river to Patna, and then been continuously on survey through hot weather and rains alike; he had completed a survey of the Son beyond Rohtās, along the southern limits of Bihār and Gaya to Monghyr, with a detailed survey of Bihār *pargana*; then a survey of the north bank of the Ganges from Monghyr to Patna, noting *pargana* boundaries; then a survey of the Gandak River as far as Bettiah.

ROUTE SURVEYS

Although most of the surveys of these times were in the nature of route surveys, this term more particularly indicates those whose immediate purpose was the survey of the marches of a body of troops or a political mission, rather than the complete survey of a particular area or boundary.

We start with the French Chief, Jean Law de Lauriston, who retreated up-country from Cossimbāzār after the English captured Chandernagore in March 1757, and wandered from place to place with a small body of French and Indian troops, visiting Lucknow, Delhi, Agra and Bundelkhand; after various adventures he surrendered to the English, and was deported to France. He kept up surveys of all his marches, and gave his map to D'Anville who had it engraved [222];

M. Law de Lauriston ayant commandé un corps de troupes dans le nord vers Delhi, me communiqua en arrivant de l'Inde, une carte dressé par lui-meme, d'apres ce qu'avoit donné la mienne; mais à laquelle il avoit ajouté en dessin rouge par distinction, des routes qu'il avoit parcourues, et sur lesquelles se rencontroient des positions assez considérables pour mériter d'être connues. Il y joignit quelques morceaux vers la frontière du Tibet, & qu'il avoit recueillis, ce qui m'engagea à dresser une nouvelle carte de ces parties séparément, et qui a été gravée sans être rendue publique[3].

Another Frenchman, Anquetil-Duperron, who travelled in India for literary purposes between 1757 and 1761, joined Law for a short time, and then travelled down the east coast from Bengal to Masulipatam; and later from Goa to Poona

[1] 72 B/5. [2] Bankipore, near Patna, 72 G/2. [3] *Antiquité Géographique* (iv). See also map, BM. Addl. MSS. 20914.

and Aurangābād[1]. He kept measurements and observations along many of his routes, but Rennell writes of that from Goa,

I lament exceedingly that he had not a compass with him, ... for in a quarter where geography is so bare of materials ... that gentleman had a fair opportunity of distinguishing himself in this way, as he may be said to literally to have trod a new path[2] [127].

Duperron has left an amusing account of the military route surveys of his day;

J'ai voyagé dans l'interieur de l'Inde, seul, en troupe, en corps d'armée. L'Officier, le Commandant, passe la journée dans son Palanquin, ou il dort le plus souvent. A la dinée, il demande ... à son *Dobachi*[3] ... combien on a fait de Cosses, par quels endroits on a passé. Celui-ci interroge les *Beras* (les porteurs) ou repond de lui-meme, parce qu'il faut repondre; & le nombre des cosses, le nom des lieux est couché sur l'Itineraire, sur la Carte.

Ce que je viens de raconter, je l'ai vu de mes yeux[4] [185].

Of the Company's soldiers, Rennell mentions surveys through Cuttack and Orissa by Polier and Campbell[5], and we have already noticed the surveys by Morrison and Nicol in Midnapore [21]. When Knox was withdrawn from Midnapore in 1763 to join the main army on its march to Patna, Nicol was charged with the survey of "Budjapore province[6]" which he carried out "with a diligence and exactness peculiar to that trusty officer", and was then despatched to survey "the roads in the Beerboona Province[7] as far as ... Calcutta". This survey was interrupted by the campaign which ended with the Battle of Buxar, and Nicol had to return to military duty[8].

To return to Midnapore, — in 1767 the Collector[9] had a body of sepoys at his disposal and John Ferguson commanded a column of these along the western borders, which were then entirely unexplored. He writes from Ghatsila[10],

A journal of my proceedings I have up to this day, but my compass went wrong the 2nd day's march to this Fort, I having it in my hand to observe our course, when the enemy set on us, and my needle, from the firing I think it must be, flew off its axis. This will in future make me very imperfect in the course, & the want of a set of mathematical instruments renders me incapable of making charts[11].

The Collector reports,

I have in my possession a copy of Lt. Ferguson's journal of his western expedition, but it is not complete enough for a map to be formed from it. I shall keep it in my hands for the present in order to make some necessary additions to it ... [12].

and the Governor replies,

I could wish to have Lt. Ferguson's Journal completed as soon as possible that we may get a chart of his Expedition to the West laid down[13].

By this time Rennell had been posted as Surveyor General, and several of his surveyors, Adams, Carter, and Portsmouth, were drafted in to make a systematic survey of the province and we hear nothing more of Ferguson's amateur efforts.

The army was now fully engaged beyond the western frontiers, and under spur from England, surveys were pushed on in every direction.

It is hard to over-emphasize the influence exerted by Orme on the surveys of India at this period [22]; amongst his papers is an autograph "Essay on the Art of War", undated, but probably sometime about 1765, written possibly for Clive or Richard Smith or some other soldier friend, and pointing out the military value of maps;

We have in general very few good charts in India. No Wonder. Our Generals have not paid that attention to the subject which it requires. ... If those in the Administration were sensible of the advantages resulting from it, they would never scruple the expence. But then great caution should be observed that none but capable men should be employed and whose integrity is equal to their capacity. To such, great encouragement should be given.

I would have a Plan of your whole Frontier, with the Engineer's observations from League to League. And where you have any Defiles, they should be accurately described,

[1] Orme MSS. 134 (43–7). [2] *Memoir*, 1793 (253). [3] Interpreter. [4] Bernoulli, II (466–7). [5] Rennell is tantalising in that he hardly ever gives a date. *Memoir*, 1783 (68). [6] or Shahābād Dist. 72 C. *Ben. Atlas* iii. [7] Bīrbhūm, 73 M. [8] Caraccioli (346). [9] In this correspondence called Collector and Resident indiscriminately; the regular office of Collector was not generally introduced till 5 years later. [10] 73 J/6. [11] *Midnapore Dist. R.* 4–4–67. [12] ib. 3–8–67. [13] *Midnapore Dist. R.* 3–9–67.

surveys having first been made with the most minute exactness. ... Route Surveys. ... From a Compleat Engineer you may go much further. He is not to confine himself to the roads only, but the situation of the country. ...

A General Officer should always be furnished with some such a chart, for it is impossible for a Council Board to form a system of operations upon the Intelligence they have received. ...

Embrace therefore every opportunity ... to send officers into a Country, where you may soon have occasion to march an Army. But such officers should be the most intelligent in the Service[1].

In 1767 Orme acknowledged receiving from Richard Smith [24],

A map of Patna to Delhi, which you say is imperfect. ... Another of the Country about Agra & Delhi, of which you have a Better opinion.

I had received before the map from Patna to Delhi, but never till now the other, which differs so very much from all preceeding informations concerning that part of Indostan, both in the quality of materials, their dispositions, and the names of places, that I readily concur in thinking it much more to be depended on then any of the former charts, because in these matters few people take pains of changing the old notions of Geography to substitute new inventions without foundation. They would be deterred by the dread of being discovered and exposed. ...

In your map of the country about Agra, I see for the first time the situation of the Countries of the Jauts and Rohillas. Get as accurate information as you can concerning the Boundaries of these countries, and the description of the peoples. ...

I likewise see in the map Pitans[2] between the Jumna and the Ganges; I can account for them.[3]

Among the surveys sent home to Orme[4] are military routes surveyed by Samuel Showers between 1766 and 1769, which include,

A Plan of part of Bahar Province, surveyed in November 1766, scale 3 inches to a mile including Sassaram and Rotas[5],

which is a road traverse along the Son River, with a loop road round Rohtās hill, and a wide area of hills shown in a distinctive conventional style which is almost exactly reproduced in Bolt's map of 1772 [223].

There are other surveys made by Showers in 1767; the Gogra River from Fyzābād to the Ganges, July to September; the rivers Karamnāsa [24 n. 7], "Gumtah or Goompty[6]", various roads from Benares, and the road from Allahābād to Fyzābād; in a journal of 1768 he writes,

We met with nothing near the Goompty, but immense fields of thick grass, which together with the shortness of the reaches, greatly conduces to render this work more tedious: the true distance of today's survey is 5 miles and 4 furlongs, the ground I have measured exceeds 14 miles. ... This day's survey has been one continuous jungle, which by the prints of their feet, is the dens of Tygers; & other wild beasts[7].

In 1768 Showers was sent on a mission by Colonel Smith to the Marātha chief at Nāgpur, travelling through "Rywary[8] ... Sahagu Ghat ... Gurrah-Mundela[9]" [296]; he wrote from Tilwāra Ghāt[10] on the Narbada,

I am credibly informed the source of this river is 50 coss East of this place, where is likewise the source of the River Soan and another small river called Tutte ... near Umarcuntuck[11] [60].

His map of the road from Allahābād to the Narbada[12] is beautifully drawn, with hills shown conventionally in elevation, and with branch roads to various important places.

Rennell acknowledges the use of Showers' work [226 n. 7], and makes the following references to his and other surveys in Bundelkhand;

Rewa, in the Bundelcund country is the most westerly point on the road leading from Allahabad to Nagpour and the Deccan that is determined by survey and latitude. From

[1] Orme MSS. 303 (109). [2] Pathāns, from Afghānistān. [3] Orme MSS. 222 (157). [4] by Bruce, Davy, Rose, and others. [5] Sasarām, 72 D/1; BM. Addl. MSS. 15739 (17). [6] The Gumti flows through Lucknow to join the Ganges below Benares. [7] Orme MSS. 8 (3). [8] Rewah, 63 H/6. [9] Māndla Fort. [10] near Jubbulpore, 55 M/16. *v.* Leckie (74–5). [11] Amarkantak, 64 F/10; letter dated 2–4–68, Orme MSS. 4 (97–103). [12] BM. Addl. MSS. 15739 (15): unfortunately quite unsuitable for reproduction.

thence to Telwarrah Gaut on the Nerbudda is laid down in a more cursory manner; but I believe tolerably exact for the purposes of a general map[1]. ...

Chatterpour ... was formerly visited, and its position determined by mensuration, from Rewah, by Captain Carter[2]. ...

The country between Mirzapour and the heads of the Soane and Nerbuddah, was explored by the late Major Bruce; ... during his expedition he verified a fact which has long been doubted, though strenuously insisted upon by the natives, viz., thet the Soane and Nerbuddah Rivers had their common source from a pond, or lake, on the southern confines of the Allahabad province ...[3].

Wilford records that Bruce made his surveys "about the year 1771"[4].

An interesting route survey from Cuttack to Sambalpur was made in 1766 by Thomas Motte, "free merchant", who was sent by Clive to sound the Marāthas as to their willingness to cede Orissa in return for an annual tribute [24 n. 8], and also to open a trade in diamonds with the Rāja of Sambalpur; one share to Motte, two shares to Clive. [pl. 13].

He left Calcutta on March 13th 1766, travelling by Midnapore, Balasore, and Cuttack. At Balasore he heard tales of "volcanos", but found them to be jungle fires. He left Cuttack on May 6th, and on the 22nd reached Bund[5]; here his tent was struck by lightning and caught fire; thirty of his followers were involved in the fire and sixteen of them died. On his arrival at Sambalpur on May 31st he found a local revolution going on, in which over 300 were massacred. Both his European companions died of fever, but Motte himself stayed till October, suffered much from fever, but was never able to come to business, and never even saw a diamond.

On October 1st the Rāja paid him a farewell visit, and begged everything he saw; it was with great difficulty Motte could save his compass, and he was glad to get away the next day. He had adventures with wolves on his return journey, but reached Cuttack safely on October 19th, and Balasore on 28th. Further negotiations regarding Orissa were abandoned owing to Clive's ill-health and return to Europe [24].

Motte writes that "Mallock, sent by Mr. Henry Vansittart", presumably on a similar errand two or three years before, "durst only stay 24 hours"[6]. Mallock's companion, Alleyne, had noted the bearing and distances from Cuttack to Sambalpur[7], and Motte also made a survey which was apparently embodied in Bolts' map [223], and was also used by Rennell who notes that,

Mr. Motte's route along the Mahanuddy was described from computed distances and bearings by a compass. He also took the latitude of Sumbulpoore in a rough manner[8].

A rough sketch of the Mahānadi is preserved at Calcutta, which bears a note to the west of Sambalpur "Diamond Mines among these Mountains"; it may be Alleyne's, for the names given do not correspond with those of Motte's account[9].

In 1774 Jacob Camac, commanding in Chota Nagpūr, sent "Golam Mohamed, a Sepoy officer, to explore the roads and countries of the Deccan", and "to gain intelligence about the Mahratta powers"; and Rennell took "the roads from Burwah to Ruttunpoor, and from thence to Gurry Mundlah, Nagpour, Aurangabad, and Burhanpour"[10] all from his itinerary[11]. Rennell further states that he was indebted to Camac for "the course of the Bain Gonga[12]...quite a new acquisition to Geography"[13].

A notable contribution to geography was the survey made by the Rev. William Smith, appointed in July 1775 to accompany Colonel Upton's political mission to Poona [2];

Col. Upton's Ambassy to Poona affording a favourable opportunity to survey the Peninsula of India, and likewise to ascertain the true Distance of the places thro' which he will

[1] *Memoir*, 1783 (68–9). [2] ib. 1793 (206). [3] ib. (235). [4] *As. R.* (399–400). [5] on the Mahānadi 73 D/5. [6] Motte's vivid narrative is in *As AR.* I. 1799; *Misc. Tracts.* (50–85); also Wills (22–43). [7] Orme MSS 67 (138). [8] *Memoir*, 1793, (241); References to Motte's bearings are made by the surveyor with Elliot's mission [39], MRIO. M. 272. [9] *Imp. Lib. M & P* 336. [10] Barwenagar, 73 A/4; Ratanpur, 64 J/4; Māndla Fort, 64 B/6; Burhānpur, 55 C/3. [11] *Memoir*, 1783 (vi, 66*n*, 69); *Ben. Atlas*, (x). [12] Wainganga R. 55 & 64. [13] *Memoir*, 1793, (246).

pass, Col. Monson[1] proposes that the Reverend Mr. William Smith be appointed to attend Col. Upton for this purpose, conceiving that the public may obtain many advantages from this survey which probably would not be able to be taken at any other time[2].

The mission started from Kālpi[3], on the Jumna, on October 24th 1775 and reached Poona on December 27th. During January and February Smith carried his survey down to Bombay and back. Rennell describes his achievement thus:

Mr. Smith set out from Calpy with Col. Upton ... and fell into the great road from Delhi to the Deccan at the city of Narwah[4]; ... from Narwah, he proceeded to Sirong[5], a city of Malwa [56 n. 16] ..., and from thence to Burhanpour, the capital of Candeish. ... In his way... he crossed the famous river Nerbuddah, formerly the reputed boundary of the Deccan. ... From Burhanpour, he went to Poonah, ... crossing the heads of the Godavery and Beemah rivers in his way; and from Poonah to Bombay.

During all this route, he took observations of latitude and longitude, as often as opportunity offered; which was not unfrequently; and with these he constructed a map, which is no less valuable on the score of its general accuracy and extensive information, than curious by the novelty of its subject. We had then, for the first time, a geographical line on which we could depend, drawn across the continent of India, through the principal points between Agra and Poonah[6].

In 1777 the Council reported that Mr. Smith

was prevented by ill health from completing a map of the country; ... he is now on his passage to Europe, but has promised to finish it as soon as possible, and take the first opportunity of sending it to us. In the meantime We have put his Journals into the hands of the Chief Engineer[7], to form a map from them[8].

The journal gives a full and detailed narrative of his survey and astronomical observations, with complete fieldbooks and perambulator traverse[9] [185].

RENNELL AS SURVEYOR GENERAL 1767–77

Before leaving India, Clive showed his appreciation of Rennell's surveys by appointing him Surveyor General, a post thus created in India for the first time, and notified thus to the Directors:

So much depends upon accurate surveys, both in military operations and in coming at a true knowledge of the value of your possessions, that we have employed everybody on this service who could be spared and were capable of it. But as the work must ever be imperfect while it is in separate and unconnected plans, we have appointed Captain Rennell, a young man of distinguished merit in this branch, Surveyor General, and directed him to form one general chart from those already made, and such as are now in hand as they can be collected in. This, though attended with great labour, does not prevent him from prosecuting his own surveys, the fatigue of which, with the desperate wounds he has lately received in one of them [23], have already left him but a shattered constitution.[10]

Rennell writes in his journal,

The 1st of Jan. 1767 I was appointed Surveyor Genl., and the Govr. (Mr. Verelst) appointed the several Surveyors ... under me,

Capt. Lewis Du Gloss.	Lieut. Carter.
Capt. John Adams.	Ensign Wm. Richards.

The three first had each a particular part of the Countrey allotted him to survey, & myself (with Mr. Richards as an Assistant) had another part.

Mine was to be; first, the Roads from Calcutta to Hadgigunge[11]; next the Cosee[12] River from its conflux with y^e^ Ganges to the Northern Frontier of Bengall.

Leaving Calcutta on February 6th, he surveyed through typical Bengal country, crossing one creek after another and "The 22nd surveyed 7¾ miles thro' a dismal Jungly Countrey infested with Tygers". He completed the 133 mile to "Hadgi Gunge" by February 26th;

[1] Member of Supreme Council from 1774; d. Calcutta, 25–9–76. [2] BS & F. 24–7–75. [3] 54 N/16. [4] Narwār, 54 G/14. [5] Sironj, 54 H/12. [6] *Memoir*, 1783 (62). [7] Post of S.G. was vacant from April to Oct. 17–77 [260]. [8] B to CD. 21–11–77 (37). [9] BM. Addl. MSS. 29213; map reproduced, Macpherson; map to be published by W. Faden. *IO. Tract* 389. [10] B to CD. 30–3–67. [11] 5 m. E. of Faridpur 79 E/14. [12] Kosi R. in west of Purnea.

I staid at Hadgigunge till the 2nd March waiting for Mr. Richards. During this time I was employed in constructing & coping a large Map of Bengall for the Governor.

The 2nd of March finding that Mr. Richards had but just left Culna, I set off for Dacca to get a supply of Men & Boats for the next Survey[1].

Meanwhile Richards surveyed the route from Calcutta through Bangaon and Muhammadpur[2], and reached Dacca March 7th.

They set out again on the 11th, working southwards into Backergunge, but Rennell had to break off and return to Dacca with fever, leaving Richards to carry on[3]. Here his fascinating journal closes, and we get but occasional glimpses of his work from his letters. He made Dacca his headquarters, sending out professional instructions to the various surveyors, and spending all the favourable months of the year out on survey himself. He himself surveyed the whole area north of the Ganges from Purnea on the west to Sylhet on the east. In September 1767 he wrote home,

I am now going to traverse the countries that lie on the East and Southeast of the Baramputrey, and you may not expect to hear from me again till near this time twelve month, as the length of the Expedition will take up near that time. I shall have a strong Detachment, and may probably go near the western limits of the Chinese Empire. No Countrey in the world perhaps is less known to Europeans than the Countries lying between China and Indostan, and indeed how should it be otherwise, as the Company have made very few discoveries till within twenty years past[4].

He did not at once proceed eastwards as here suggested, but in November writes,

I am now in the midst of my journey to Thibet. Being got into a more northern Climate and in the neighbourhood of the Mountains I breathe a cool and healthy Air[5].

He writes from Rangāmāti [pl. 14],

I have made one short trip to the Northward, but was obliged to return again with some precipitation as the Boutese had drawn an army together to oppose my Progress. I very nearly fell into an ambuscade which they had laid for me, but escaped with the loss of one man dangerously wounded. I was obliged to retreat a considerable way thro' an Enemy's Countrey perpetually harassed by their detachments, and crossed a deep river in my way. I hardly ever experienced more fatigue at one time, however my health has not suffered in the least.

I am now in the midst of the Forests of Rangamatty which are chiefly inhabited by wild Buffaloes, Elephants, Rhinoceros, and Tygers; the tracks of most of these terrible Animals I see every day. I never saw a just description of the Rhinoceros in any Books that I have read. It is about the size of the Elephant, and rather an overmatch for it. It feeds on Herbs, and frequently makes excursions to the Plains[6].

He spent all his time when not out on survey in compiling the surveys that were sent in to him. In December 1768 he was able to write,

The business in my Department goes on briskly, and next year we may expect that the Geography of these Kingdoms will be as well known as that of most Countreys in Europe.... A great progress is made in the surveying of the Western Countries, so that we have now measured a line of near 14 degrees of Longitude[7].

Of the surveyors first posted under his orders, we have already noticed De Gloss at work in Bihār, and his withdrawal in 1768 [22]; Adams surveyed roads in Midnapore, and certain rivers in western Purnea, and died during 1767; Carter worked in Midnapore, Jungleterry [34 n. 9] and Chota Nāgpur, and appears to have continued on survey till at least 1772; Richards continued till the survey was closed down.

Other surveyors were brought in as they could be obtained, military officers possessed of some knowledge or aptitude. Each officer received the Surveyor General's instructions as to the area he was to survey, the principal towns to be included, and the routes by road or river he was to traverse, generally in the form of a network; occasional latitudes were observed.

[1]La Touche (86–93). [2]79 A/16; 79 E/11. [3]ib. (94), 23–3–67. [4]HMS. 765, 25–9–67. [5]ib. 16–11–67. [6]HMS. 765, 20–1–68. [7]ib. 30–12–68.

In 1768 report was made to the Directors that,

A number of Gentlemen are employed on a Survey of the Provinces; the Boundaries are almost finished and they are now taking the Sections of the several Countries. In September next I hope to have the pleasure of sending you a complete and particular Plan of all your possessions in this part of India. In tracing and examining such an immense Tract of Country, the greatest Part of which affords not the least conveniency to an European, the Expense must necessarily be great; but the Benefit of such an Undertaking will be an ample Compensation for the Charges that are attendant upon it[1].

In 1770 Rennell wrote,

All the work in the Field will be done by the end of '71, but then it will take several Months to inspect and compile all the Materials[2];

and again,

Besides the Surveys of Bengall and Bahar (the Company's Territories) carried on under my direction, the officers of the Army [29] have surveyed the inland Countries belonging to Sujah Dowlah[3] and several independent Princes ... situated on both sides of the Ganges, So that the whole extent corrected by our Geographers is upwards of 14 degrees of Longitude and 9 of Latitude[4].

and again the following year,

I have entirely done my business in the field, and all that remains to be done to complete the General Survey of Bengall, Bahar, our part of Orixa [24 n. 8], and the Provinces of Allahabad & Awd will be completed within these 4 months. The sea coast & rivers also have had a regular survey, and a surveyor [16–7] in a sloop has been all round the Bay of Bengall and described the sea coasts & islands. It will now be my business to compile all these surveys, & for that purpose I am now setting down seriously for at least 13 months[5].

again, in 1772,

The Provinces of Bengall and Bahar were formerly divided into about 28 grand Divisions answering to our Counties, tho' few of them were so small as Devonshire, and these grand Divisions were again divided into Pergannas. ... The Boundaries even of these inferior Divisions are chiefly ascertained, with every Town of note in the Provinces, together with all the Roads and Rivers[6].

In 1774 Rennell completed his series of Provincial Maps, which he submitted with smaller scale General Maps, and an account of their construction, and a small index showing the areas covered by each surveyor[7];

Rennell	... ...	From Purnea to Sylhet
De Gloss	... ...	Part of Burdwān
Richards	... ...	Chittagong, and Bihār north of the Ganges
Huygens	... ...	Rājmahāl Hills
Carter, Portsmouth, Call		Midnapore to borders of Chota Nāgpur
Martin	... ...	Districts E. of the Hooghly; Cooch Behār
Russell	... ...	Shahābād
Ritchie	... ...	Coastal areas Balasore to Chittagong

After giving an account of the survey, signed January 17th 1774, he remarks,

It is hoped that the tedious delay in the execution of this work will be pardoned, when it is known that the materials from which it is compiled, consist of 500 original surveys; and as these were the work of 10 different gentlemen, it is natural to suppose that from so great a diversity of Instruments and Measures, the lines of Bearing and Distance must frequently disagree; and indeed the Truth is, that the Comparing and Correcting of them employed a large portion of the time.

I will not pretend to say that every particular part of these Maps is perfectly accurate; but I can vouch for their being generally so, and that no capital errors appeared during the examination and Construction. In order that every Surveyor may be answerable for his own work, I have added his name to it in the Maps; and at the end of this page have particularized the Tracts surveyed by each [224].

I hope that it will not be expected that every small Purgannah...shonld have its limits defined in these Maps....A certain gentleman of Rank has remarked this unavoidable defect in a Map drawn for his use. ...

[1]From Mr. Verelst, Governor, to CD. 28–3–68 (42). [2]HMS. 765. 30–10–70. [3]Wazīr, or Nawāb, of Oudh. [4]ib. 2–11–70. [5]Letter to Palk, 12–11–71, Palk MSS. [6]HMS. 765, 15–3–72. [7]Now preserved at the India Office [224].

First then, the lines traced during a general Survey, tho' at a convenient distance from each other for the purpose intended, do sometimes fall without the Boundaries of small Districts; by which they escape notice, ...

2ndly, The Peasantry, from whom the Knowledge of Boundaries, etc., is chiefly derived, frequently use different names from those in the Government Books, ...in short in some Parts they adhere to the ancient Division of Lands, and in other to the modern. ...

Lastly, the difficulty...of securing Intelligence of any kind; as has often happened in places where the Natives either through fear desert their habitations, or through obstinacy refuse their assistance.

The maps give occasional information of interest such as,

The space within these Hills [Rājmahāl[1]] has never been explored by any European, & is seldom visited by the inhabitants of the circumjacent plains.

and of the Garo Hills[2],

Mountainous country independent of Bengal; Mountains from 900 to 1,000 yards perpendicular height [20].

The surveyors made no effort to penetrate into heavy jungle or difficult hills; across the jungle area to the east of Cooch Behār is a note "Tract of Country unexplored ... subject to a Bootan Rajah"; along the foot of the mountains to the north of Bihār the country is marked WOODS, and little detail is shown; on the north boundary of Chittagong District is a note "The course of the Fenny within the Hills is not known."

In submitting these maps [224] Rennell reports that

the Surveys of Midnapour, Jellasore[3], Bissunpour[4], Purneah & Boglipour[5] are not quite finished, but will be completed during the present fair season...

and Government then direct—in General Orders—"that all surveys except those particularly specified should cease on the 30th of June 1774[6]".

These surveys had not been carried on without incidents and excitements, although, considering that the Company's officers were only just starting to take over administration in some areas, and that in others the people had not yet accepted the English rule, it is surprising to find how smoothly the work proceeded [296]. The regular surveyors could not work without large escorts, which they obtained from the battalions maintained at the disposal of the civil officers [300].

In 1773 Warren Hastings established a close alliance with the Wazīr of Oudh, whose western frontiers were threatened by the Marāthas, who had conquered Delhi the year before; the Wazīr agreed to pay a subsidy for the protection of his territories by the Company's troops, and was allowed to take over the provinces of Allahābād and Rohilkhand[7]. Several officers were sent up on survey, amongst whom were Marsack, Martin, and Ritchie; Polier, who had been lent to the Wazīr as an Engineer, was placed in charge, and Rennell reports that,

On the 5th April 1773 Major Polier was put in orders to superintend the Surveys taken in that Province. In consequence of that order I have neither issued orders to, nor received Returns from, any Surveyor in that Province. ... I furnished him with sketches of the country to enable him to point out what remained to be done, and also gave him my opinion at large on the routes to be chosen, and the method of surveying them; I even pointed out each particular route, and I perceive that in general he has followed my advice[8].

At the end of June 1774, this survey was closed down with all others.

Later in the year, Capt. Browne, "commanding the Light Infantry" and in political charge of Jungleterry[9], detailed one of his officers, Andrew Pringle, to carry out surveys of the area;

The present situation of the Corps at this place presenting a favourable opportunity for Performing a part of the Surveys ordered by the Hon. the Governor, you will please to proceed on the following ones mentioned in the Surveyor General's Instructions[10].

The routes to be surveyed covered the country lying between the Rājmahāl Hills, Dumka, and Madhupur[11]; the country was in a disturbed state, and Pringle

[1] 72 P. [2] 78 K. [3] Jaleswar, 73 O/1. [4] Bishnupur, 73 M/8. [5] Bhāgalpur, 72 K/12. [6] BSC. 24–2–75. [7] 1st Rohilla War, 1774. [8] BSC. 24–2–75. [9] On the border between Bengal & Bihār, roughly corresponding with the present Santāl Parganas. [10] BRC. 7–4–75 (9) dated Chakāi, 72 L/6, 18–10–74. [11] falling in 72 L & P.

was unable to complete the whole area before he had to close work. Whilst on survey at Deoghar, his zeal led him to interfere with the native adminstration, and he was severely reprimanded by the Council [295].

In January 1776 Rennell was able to submit the remainder of his maps [225], and Government forwarded to the Directors,

A compleat sett of Maps of the Company's Provinces and of the Dominions of the Nabob ..., formed and drawn by Major Rennell, your Surveyor General, which will of themselves, without any commendation on our part, sufficiently manifest his Merit and Abilities in that line; however we cannot avoid this Occasion (in which we acquaint you that the surveys of the Country have been entirely compleated) to repeat how highly deserving we think Major Rennell of your Favour & Bounty[1].

Rennell was not however yet satisfied that everything possible had been completed, and he addressed Government on September 12th,

After the most careful and deliberate examination of the General Maps formed from the Surveys and other materials in my office, ... I find that some more Surveys are required to complete the General Geography of these Provinces, as well as those of Oude, Ellahabad, Agrah, and Delhi.

How far a continuation of the Surveys, when attended with considerable expense in the execution, may be an object of administration, I am not capable of Judging; but as a Surveyor, I think it my duty to point out the defects of the Maps[2].

He submitted an estimate of the work required and the expense—4 surveyors, average 3¼ months each, Rs 14,000.

1st. In Ramgur and Palamow[3], no surveyor has ever yet been employed. The idea that we have of the interior parts of these Districts, is from some sketches and remarks made by Capt. Camac, Lieut Fennell, ... [225]. The principal parts of Chuta-Nagpour, Toree, and Koondah[4], were regularly surveyed by Lt. Fennell, who died whilst on the Survey. He had instructions to survey Palamow and Ramgur also. ... This survey will take up 5 or 6 months.

2nd. In Jungleterry and Rājmahal there is three months employment for a Surveyor. Ensign Pringle...chiefly attended the motions of the battalion of Light Infantry; and till very lately was not able to undertake any survey at a distance from the main body, for want of a sufficient Escort. As the tranquillity of these Districts appears to be restored, the ensuing fair season seems a very proper opportunity for completing the survey.

3rd. In Cooch-Beyhar and Buttis Hazary[5] there is employment for a surveyor during 2 months. When the Northern Frontier was surveyed by Mr. Rennell, neither of the above Provinces belonged to Bengal. They were reduced in 1773; and a Surveyor[6] was sent thither; but he fell ill before he had half compleated his task.

4th. In Midnapour, Injellee[7], &c. there remained about 2 months work to be done, when Lieut. Call fell ill there in 1774 [294–5].

Surveys are wanted in Oude, Ellahabad, Agrah, and Delhi,

There remains great room for Improvement in the Map of these soubahs. The present Map can properly be considered only as the Skeleton of one, since many of the Boundaries of Countries, publick roads, & Courses of Rivers, are wanting. But as the general distances, and relative positions of the Capital Towns are ascertained, it will be no difficult task to fill up the intermediate spaces. ...

I would propose that one party should be confined to the Districts of Cheet Sing[8] (that is, Benares, Gazypour, Jawnpour and Chunar[9]), and its neighbourhood; and that the other should make the Tour of Agrah, Delhi, and the western Parts of Oude & Ellahabad. These Surveys conducted on an economical Plan, would hardly cost more than 15,000 Rupees. ...

It is intended that only a few of the roads shall be actually measured; and those only for the purpose of joining on some former surveys to the late ones. ... All the remaining Roads are to be traced by cursory Bearings and estimated Distances; and are afterwards to be corrected, in some cases by observations of Latitude, and in others by known points in the Map. This will prove an expeditious method; and as the general Distances are already found will answer every purpose required.

On this the Board agreed

[1] B to CD, 20–3–76 (14). [2] BPC, 28–10–76 (14). [3] Rāmgarh, 73 E/10; captured by Goddard 1772; administration then entrusted to Camac; Palāmau, 73 A/1. [4] Tori, 73 A/10; Kunda, 72 D/12. [5] Dist. of Jalpaiguri. [6] Martin [225]. [7] Hijili along right bank of Hooghly. 73 O/13 to 72 N/16. [8] Chet Singh, Rāja of Benares; rebelled against Company's control, 1781. [9] Jaunpur, 63 J/9; Chunār, 63 K/16.

to permit him to execute these Surveys in the manner and to the extent proposed by him, confiding in his judgment that the expense will not exceed the estimate. ... the Board leave the choice and appointment of surveyors to him[1].

The surveyors employed appear to have been; — in Rāmgarh, Charles Ranken, of whom Rennell reports in January 1777,

In consequence of Lieutenant Ranken's having represented the impracticability of carrying on the survey of Ramgur, Nagpour, and Palamau during the present troubles, I directed him to discharge his People, and wait a more favourable opportunity[2] [38].

— in Allahābād and Oudh, John Moulton, who was still working there two years later; — towards Delhi and Agra, Robert Dawes; and — in Cooch Behār, Andrew Pringle, to whom Rennell sent the following instructions on December 25th 1776;

You are hereby directed to survey the unexplored parts of Coos Beyhar and Buttis Hazary; you will therefore proceed by way of Dinagepour[3] towards that station, and commence your survey at Consamahgunge[4] on the River Teestah[5], taking a cursory survey of the Road from thence to the Cantonments at Sahebgunge[6] in Coos Beyhar. ...

It is not intended that you should enter the thick part of the forest, but only to ascertain the extent of the cleared Lands; ... you will please to note the respective situations of Jelpigory[7] and Paharpour; ... you are to inform yourself of every particular relating to the countries that lie on the north and west of your station, and particularly of the passes through the great mountains.

Further routes which will serve to join on Capt. Martin's surveys in Coos Beyhar to mine in Rungpore; ...you must ascertain the Boundary of Coos Beyhar towards Bootan....The distances in the routes marked *Meas.* are to be measured, the rest to be estimated only[8].

Pringle completed this work by the following April and returned to his unit.

Rennell had now accomplished his great task to his own satisfaction, and had received permission to return to England on a pension. He was crippled by wounds and constant ill health, and had endured the enervating climate of Eastern Bengal without respite for thirteen years.

On March 31st 1777 he writes his last official note to the Governor General in Council;

As you have not been pleased to appoint a successor to me to in the Office of Surveyor General, and a part of the surveys resolved to be carried into execution...being still unfinished, I have thought it my duty to lay before you the following...account of the construction and state of the Maps of Bengal, Oude, etc. with Instructions for the use of the Surveyors whom you may hereafter be pleased to appoint, to supply the deficiencies. ... All instruments remaining on charge have been sent in to the Chief Engineer[9],

A few days later he laid down his office and departed for home.

In 1850, seventy-three years after Rennell had left India, Waugh reported that only half the area covered by Rennell's surveys had been superseded by later surveys.

[1]BPC. 28–10–76 (14). [2]BPC. 20–1–77 (5). [3]Dināj pur, 78 C/9. [4]Khānsāma, 78 C/9. [5]The old course [20 n. 4]. [6]78 B/15. [7]Jalpaiguri, 78 B/10. [8]BPC. 28–4–77 (19). [9]Letter from Rennell 31–3–77; BPC. 28–4–77.

CHAPTER III

BENGAL SURVEYS 1777 TO 1794

Thomas Call as Surveyor General, 1777–86 — Goddard's March to Bombay, 1778–9 — Pearse's Marches along the East Coast, 1781–5 — Political Missions, 1781–90 — Wood & Kyd, 1786–94 — Wilford in Benares, 1788–94 — Coasts of the Bay of Bengal, 1779–87 — Andaman & Nicobar Islands, 1788–96 — The Hooghly River — Calcutta.

IT was not until six months after Rennell had left India that Thomas Call was appointed to succeed him, "for the purpose of receiving and compiling the Maps and Reports of the Surveyors now on duty".

Rennell had completed the survey of practically the whole of the territories now controlled from Fort William, but very little was known of the countries beyond. However, the general unsettled state of India in these days and the vigorous policy pursued by Warren Hastings gave many opportunities for the extension of geographical knowledge, and though Call had few regular surveys to control and organise there was a constant demand for surveyors to accompany political missions and military expeditions.

Government was not always ready to take such opportunities, for in February 1777, when the Commander-in-Chief asked that Mark Wood, Field Engineer, might survey the Ganges "from Mindeeghat to Hurdawar[1]" and return along the foot of the hills to the north of Rohilkhand, the Council replied,

> Having already given directions for executing all the Surveys which were recommended to us by the Surveyor General as requisite for completing the General Geography of this country, we think it unnecessary to undertake the Survey of the River, ... especially as that tract lies at such a distance from the Company's possessions[2].

In December 1777 Ralph Broome was sent up to survey the hills of "Jungle Tarai[3]" at the request of Captain Browne, Collector as well as "Commanding the Light Infantry[4]". Four years later a surveyor was sent up at the request of Augustus Cleveland, Collector of "Bogleypoor[5]", to assist William Baillie on his survey between Colgong[6] and Rājmahāl.

Between 1778 and 1783 Andrew Pringle was employed on the survey of the Subharnarekha River[7], and parts of Rohtās and Shahābād[8].

In 1779 John Moulton writes to the Surveyor General from Lucknow describing his surveys in Rohilkhand and Oudh;

> I have been very particular in shewing the country through which I surveyed in the state it was, that is, whether close or open, jungly or cultivated, or otherwise; also the more minute remarks, expressing all tanks, whether pucka or dug, nor have I omitted a single pucka well.
>
> The boundaries of the different Pargannahs are also marked with an accuracy that may be depended upon, as I had very intelligent people in my service for the business....

He discusses the crops & produce of the country, the names of towns & rivers, and compares them with "the general map of the country";

> The very constant wet weather has rendered the air so damp as has prevented my finishing my plan with the expedition I could wish; add to that the bad quality of the paper on which I lay them down (though the best I could procure) has been another unfavourable circumstance to my proceedings; though I have the satisfaction of knowing that what I do send will bear the nicest inspection hereafter; and which I am also inclined to flatter myself will meet with your approbation. ... The survey is laid down 2 miles to an inch[9].

[1] Mindi Ghāt, 54 N/13; Hardwār, 53 K/1. [2] BPC. 28–4–77. [3] Jungleterry [34 n. 9]. [4] BRC. 27–1–78. [5] Bhāgalpur, 72 K/12. [6] 72 O/4, BRC. 14–6–82. [7] 73 E.J.O. [8] BPC. 13–11–83. [9] MRIO. M. 229. 13–8–79.

In the same year William Hyde, acting Field Engineer with the force at Cawnpore, was deputed to survey "all the Ghauts and places" along the Jumna, from Mūsānagar[1] to Kālpi and thence to Etāwah[2];

> The great importance of having a thorough knowledge of all the Gauts and Fords upon this river, by which these Provinces have generally been entered whenever they have been Invaded by the Mahrattas is too obvious; ... no regular Survey has ever yet been taken of them.

Government approved that he should extend his survey to Allahābād "under the particular instructions of the Surveyor General[3]". Hyde made other surveys along the same stretch of the Jumna, and through the neighbouring country, during the cold weather of 1786–7[4].

Rennell records that George Perry of the Engineers was sent by "Mr. Hastings" to explore

> the SE. parts of Berar[5] ... as well as the adjacent parts Bordering on the Circars, which have remained an absolute Blank in the most modern of our maps[6].

It is not likely that Perry was able to do much to fill this blank, for he was recalled in 1785, and Rennell writes later,

> There yet remains in the map, between the known parts of Berar, Golconda, Orissa and the Circars, a void space of near 300 miles in length and 250 in Breadth; nor is it likely ever to be filled up, unless a very great change takes place in the state of European politics in India[7].

Charles Ranken had resumed his survey of Rāmgarh, [36], covering the southern half of the present Hazāribāgh District[8], till in 1781 he was diverted to the lay-out and construction of a military road from Calcutta, across the Rāmgarh plateau, to Sherghāti[9] and Chunār[10].

As part of his regular duty as an engineer, Thomas Brown was employed for about two years from 1784 on a large scale survey of Benares City and its environs[11]; and between 1782 and 1785 Mark Wood and other Engineer officers were employed under the Chief Engineer on a similar survey of Calcutta [52].

During his time as Surveyor General, Call specially devoted himself to the preparation of an Atlas of India, and employed Indian *munshis* and *harcaras* on filling in the many gaps [286], but in the economy campaign which followed the close of the Mysore War, Government ordered these and all other surveys to be closed down, and "that none be employed on this duty in future but by the special order of the Board"[12] [5, 277].

The Directors were in due course informed that,

> The Surveyor General's office has been confirmed under some restrictive rules, which are calculated to keep Government informed of the Progress of the Works carrying on in it, and to call their Attention to those occasional Services which might otherwise be unnecessarily prolonged, and entail an expence beyond the Period for which its existence was required[13].

GODDARD'S MARCH TO BOMBAY, 1778–9

Two historic events gave special opportunities for adding to geographical knowledge; Goddard's[14] march to Bombay, and Pearse's marches along the East Coast.

The first occurred in 1778, when a Bengal detachment was sent to assist the Bombay Government against the Marāthas. The force set out from Kālpi on June 3rd 1778, and advanced slowly through Bundelkhand until October 8th, when Goddard assumed command on the death of Colonel Leslie. Goddard was a vigorous commander and achieved undying renown during the campaigns of the next four years. He brought his force to Hoshangābād, on the Narbada, by December 1st,

[1] 54 N/16. [2] 54 N/1; a beautifully drawn map, BM. K. 115/36. [3] BPC. 6–9–79 (11, 12). [4] Journals & Fdbks. MRIO. M. 206–7. [5] Pl. 1 show extent of Berār, the territory of the Marātha Rāja of Nāgpur. [6] *Memoir*, 1785 (112). [7] *Memoir*, 1793 (246). [8] Map on ½-inch scale, MRIO. 56 (4). [9] 72 D/14. [10] Road described, Lister (142); abandoned after construction of *Grand Trunk Road* in 1838. [11] B to CD. 7–3–86 (27). [12] BMC. 10–3–85. [13] BS & Sep. to CD. 9–1–89 (71). [14] Thomas Goddard Ben. Inf. d. at sea off Land's End, 7–7–83; *EIMC.*; *DNB.*; *DIB.*; Hodson.

and was held up there for six weeks waiting for orders and cash[1]. Setting out again on January 16th, they reached Burhānpur by the end of the month, and Surat by February 25th 1779 [4, 121][2].

Arthur Caldwell, of the Engineers, kept a survey of the route as far as Burhānpur, 580 miles, which he protracted in 25 sheets on the one-inch scale[3], a survey which was held up as a pattern to surveyors thirty years later as "an excellent example of minuteness and perspicuity[4]", and was of particular value because "it touches on the route of Mr. Smith [30–1]" at certain points[5].

When discussing the policy of sending this detachment Warren Hastings had noted that it would pass through

> the district of Bhopal, which is under the government of a Pathan chief. ... I am not master of the exact geography of this country, that is neither mentioned in our maps, nor known at this distance but to persons who have occasionally passed through it[6],

whilst Philip Francis who had strongly opposed the expedition, commented,

> Col. Goddard's Army is now near Eleven Degrees West of Calcutta. We have no other way of tracing his progress, or ascertaining his Distance from us, but by observing, as accurately as we can, the Latitude and Longitude of his Position on a General Map of India[7].

The survey of the last stage of Goddard's march from Burhānpur to Surat was carried out by Duncan Stewart [121–2].

Whilst the detachment started from Kālpi, a political mission was sent from Cuttack to Nāgpur under Mr. Elliot[8], to negotiate a treaty with the Rāja of Berār, that should include a safe passage for Goddard's force.

The mission left Cuttack on August 11th, and in addition to Elliot, private secretary to Warren Hastings, comprised Mr. Robert Farquhar, Captain William Campbell [qv.], and Lieutenant James Anderson[9].

A journal of the whole route from Cuttack to Hoshangābād is still preserved at Calcutta[10], and was apparently kept by Campbell; the records are entered with precision, and give frequent compass bearings, direction of flow of streams, bearings to hills, and careful notes as to the nature and the features of the country; the time of passing each recorded detail is entered, and the distances calculated at rates varying from 3 to 4½ miles an hour. In the earlier marches constant comparison is made with the bearings given in Motte's journals of 1766 [30].

The protraction of this survey, made some years later, is preserved in another book, apparently in the handwriting of Robert Colebrooke, who quotes word-for-word extracts from the original journal, and adds occasional remarks such as,

> These two stages have been laid down at 3 miles per hour, but as the Author of the journal appears to have travelled in his Palankeen, it is possible that the distance (where the road was good) may have been a little underrated[11].

The mission was overwhelmed with disaster in the heart of the jungle, losing both Elliot and Farquhar[12] from "jungle fever", whilst Campbell was sick for many days of the same complaint[13]. The party reached Nāgpur on November 15th, but with Elliot's death the whole political purpose of the mission had collapsed. The journal was kept up with but few intervals, which correspond with the periods of Campbell's sickness, and closes on December 21st at Hoshangābād, where Goddard's force was halted.

Two journals of the route from Nāgpur to Cuttack are preserved, both made in 1782. The first, January 28th to February 27th[14], kept by a Mr. Thomas [296] who had travelled to Nāgpur from Benares, is quoted by Rennell; the second, March 25th to April 24th[15], was kept by Mr. White of Chapman's embassy [42]. White found Elliot's tomb "on the bank of the Laut Nuddee" "in pretty good

[1] Three lakhs of Rupees arrd. from Nāgpur, Jan. 12th. [2] *Journal of the March*...pub. by W. Faden. *IO. Tract. 389.* [3] Maps, worth inspection, MRIO. 118 (5) & IO. Maps IAC. 16. Fdbk., with diary of military actions, MRIO. M.541. [4] DDn. 82 (138) Sackville to SG. [5] *Memoir*, 1793 (204). [6] BSC. 8–6–78. [7] BSC. 11–1–79. [8] Alexander Kynynmound Elliot, Ben. Civ.; bro. of Sir Gilbert Elliot, who as Lord Minto became GG. in 1807. *Memoir*, 1793 (239, 240) and Clements Markham (cxxxviii, cxlv). [9] Ens. Pen. Inf. 29–7–76; Resdt. with Sindhia 1785. *DIB.* [10] MRIO. M. 272. [11] MRIO. M. 320 (87). [12] Elliot d. near Sārangarh 12–9–78; Farquhar d. near Ratanpur 15–10–78; [13] BSC. 28–9–78 v. Bio-Notes sv. Campbell. [14] MRIO. M. 163 (40–4) & M. 229 (11–18), and BM. Addl. MSS. 13588 (110). [15] MRIO. M. 229 (19–27).

repair & obtained the Rajah's promise to keep it so[1]". Thomas refers to the tragic fate of the mission which he says

consisted of five gentlemen[2], the only Englishmen who ever went this road before me, and one only reached General Goddard's army alive. ... The journal of this Gentleman, but whose name I have not learned, lately came into my possession, and I esteem it a truly valuable Geographical document.

During Goddard's campaigns on the west coast from 1779 to 1782, a force under Jacob Camac kept the Marāthas engaged from the east, and William Cameron, surveyor to this force, "surveyed the roads and country between Etayah and Sirong[3]", and mapped "the Gohud and Narwah provinces[4] between the Chumbul and Sinde rivers[5]".

At the conclusion of peace with the Marāthas the Bengal detachment marched back from Surat to Bengal, and reached Cawnpore in April 1784, reduced to about half its original strength[6]. The reason for these difficult marches in preference to sending to troops round by sea, was the inveterate objection of the sepoys to sea travel; the great opportunity for the acquisition of geographical knowledge was one of the compensations.

PEARSE'S MARCHES ALONG THE EAST COAST, 1781–5

In 1780 Haidar Ali of Mysore invaded the Carnatic in great force; Hector Munro assembled his few troops to protect Madras, and summoned Colonel Baillie's detachment from Nellore; within nine miles of Munro, Baillie was intercepted by the Mysore army and hardly a man of his force escaped death or capture[7].

Warren Hastings on hearing of this disaster, at once organised a relief expedition from Bengal. Sir Eyre Coote was sent by sea with the few European troops that could be spared, but the sepoys had to be marched. Six battalions and 16 pieces of artillery were assembled under Colonel Pearse, and marched from Midnapore on January 21st 1781 [4].

The force was troubled from the beginning by frequent desertions, and the state of discipline amongst the English officers was very low.

When the detachment first started ... Pearse met with much opposition from the Battalion commanders, because he insisted on counting the files himself on parade, thus appearing to impugn the honour of the officers who had submitted parade states.

There was great difficulty in obtaining food supplies, and even cash; there were political difficulties with local chiefs and with the Marātha rulers. Passing through Orissa, at that time under the Marātha Rāja of Nāgpur, Pearse writes,

I am passing through a country as little known as if it were in the midst of China. We always understood that the whole country was a wilderness from Jellasore[8] to Balasore. My march lay to the end of that wood through plains so extensive that I saw the sun rise from a fair horizon, and I found the country in the highest state of cultivation.

Without any previous knowledge of the road, the force had great difficulties as regards camping;

We were to march at four the next morning, and I was fatigued as well as the troops, by having been on the road from five in the morning till past eleven, and the rear guard passed my tent at four. Yet the march ... was only six miles. ... Today we marched at four, and I intended to reach Surong[9], being told we had only six *Coss* to go, which as I understood it, was but twelve miles. At 8 o'clock the advanced guard reached the place of our present encampment; here expecting to learn that Surong was just at hand, I learnt that it was four *Coss* distant, and that we had travelled somewhat less than two *Coss*; by the actual measurement we travelled eight miles and a half, therefore according to the country mode of estimating, we had four more such *Coss* to travel (as we had marched two), that is 16 miles; it would have killed at the cattle to have attempted it[10].

[1]The tomb, erected by Warren Hastings, was still kept in repair in 1870. Grant (464). [2]Only 4 members; see account of mission by Wills (47–83). [3]Etāwah, 54 N/1; Sironj, 54 H/12. [4]Gohad, 54 J; Narwār, 54 G. & K.; Sind R. 54 G. to N. [5]*Memoir*, 1793 (205, 233); Maps, BM. Addl. MSS. 13907 (d, f). [6]Journals by unnamed surveyor, MRIO. M. 206–7. [7]at Perambākkam, 57 O/16; 10–9–80; Bowring (89–93). [8]Jaleswar, 73 O/1. [9]Soro, 73 O/11. [10]*Ben. P & P.* III (76) to Warren Hastings, 17–2–81.

They reached "Juggernaut" (Puri) on March 7th. On the march through Ganjam, the detachment was attacked by cholera and lost a large number of men and officers, and on April 5th Pearse wrote,

> That I may carry 3,500 men to Coote is the utmost of my wish, and I think he will have no reason to wonder there are no more, when he considers the great distance, without a single day's fighting to divert their minds from a country that seems made up of the shreds and fragments of a world in Dame Nature's shop, producing nothing but sand and craggy rocks, brackish water, and pestiferous winds. If you ever want to send an army to Madras again by land, it must be done through Nagpore and the Nizam's country [59]. ...
>
> The surgeon who came to us from Ganjam was taken ill the morning before last and was dead before 9 p.m. of this disorder [cholera]; if we lose another we shall be undone[1].

There were two European surgeons with the force and the hospitals were full the whole time; tents were issued for the first time at Vizianagram[2] about April 11th. They reached Ellore[3] on May 20th, and halted there ten days, by which time they numbered 3,000 fighting men; they reached Nellore on July 25th, and St. Thomas's Mount on August 3rd.

A survey was kept of the route from Midnapore to Ganjam by Patrick Douglas, who notes that,

> Distance of each day's march is laid down in miles and furlongs, measured by perambulator. At the end of every day's march, a certain allowance is made to rectify it, according to the ground marched over. ... [Results] may not be exactly true, but the army was marching *in the night,* and this an enemy's country[4].

Douglas could not continue his survey the whole way because of constant trouble with his perambulators [199].

On arrival at Madras the force was broken up and distributed amongst the various brigades, and the staff appointments, including that of Surveyor, were abolished; but the battalions bore a distinguished part in all the fighting that followed in the next two years.

Hostilities were concluded towards the end of 1783, when the Detachment was re-assembled and encamped near Madras until the end of April 1784 whilst the details of peace were settled. On November 15th Pearse appointed Robert Colebrooke to be Surveyor which post he held throughout the return march to Bengal.

The detachment left Madras on April 22nd, and reached Ellore June 1st. Pearse had suggested marching through the hills via Sambalpur and Raipur, in preference to following the low lands during the rains. Government did not approve, but directed that he should canton his men at some place along the road[5]. They reached Vizagapatam on June 29th, and moved into cantonments near Chicacole[6] in the middle of July, remaining there till October 31st. They then resumed the march, arriving at Gaurhāti on the Hooghly, January 15th 1785.

The services of the detachment were recognised by a special General Order published on January 22nd, announcing rewards in the form of swords of honour, standards, medals, and gratuities, and two day's later Warren Hastings himself honoured the camp with an inspection, one of the last public ceremonies he attended before leaving India[7].

Throughout the return march Colebrooke had kept up a very careful perambulator traverse[8]. Pearse, an experienced astronomer himself, trained him in the art of taking observations for latitudes and longitudes, and they both observed at most of the principal places they passed through [155, 185].

In submitting the survey to Government Pearse writes,

> I held it to be as much a part of my duty to conduct a regular plan of my route, (I have knowledge of the modes), as to make a true return of the number of men. ... I hope the accuracy of the survey will entitle it to your approbation. ... From what I have thus shewn, I will venture to say, that this survey excels all I ever heard of in accuracy, if not extent.

[1] *Ben. P & P.* III (92) to Warren Hastings. [2] 65 N/12. [3] 65 H/2. [4] Fdbk. BM. Addl. MSS. 29215 (23). [5] B.S. & F. 8-6-84. [6] 65 N/15. [7] *Ben. P & P.* VI (294). [8] Journal & Fdbk. MRIO. M. 145; Map in several sheets MRIO. 149 (21, 33–35); see also Dalrymple's *Plan of the Chilka Lake,* with Colebrooke's route "Ganjam to Jaggernauth", *Oriental Repertory,* II.

Should the Board be pleased to order it to be published by their printer[1], it might serve to shew to others how surveys ought to be made and how they actually can be made, with little trouble, by the surveyor of any detachment that may march into remote parts. ... The surveyor's journal is large, and that would shew any future detachment every difficulty it would have to encounter, in a march of above 1124 miles; I might have saved much time and fatigue, if I had had such information when I went towards Madras; what I did get was really very deficient[2].

and again,

The survey was ... finished with astronomical observations, which prove its value to be far superior to anything of the kind I have heard of. If Mr. Smith's, made on the same foundation, is superior, it is the only one [31].

This line was hailed by Rennell and other geographers as a most important contributation to the correct geography of the east coast, and it remained the undisputed authority for more than a generation[3].

POLITICAL MISSIONS, 1781–90

To establish friendly relations with the Marātha Rāja of Berār during the war with Haidar Ali, Warren Hastings sent a mission under Charles Chapman[4] to Nāgpur in November 1781. James Ewart, whose skill with the sextant came from several years service with the Bombay Marine, was attached to the mission as surveyor, and ran a traverse from Chatra, through Lohārdaga, Ratanpur, and Khairagarh to Nāgpur[5], besides surveying various routes whilst stationed there, the Surveyor General reporting that,

he not only sent me his Route laid down from observation and measurement, but during his stay at Burra Nagpour he was very attentive in making astronomical observations and procuring me several routes from Cossids[6].

In 1784 he closed his traverse by returning to Benares by a route through Mandla[7] and Rennell observes that, except in the intervals between his measured lines, Ewart's routes entirely superseded those of "Golam Mohamed[8]".

Another opportunity for surveys to Nāgpur occurred when George Forster was sent there as Resident in 1788, James Rind making a survey of his route from Kālpi; Rind who also had served in Bombay marine, made other surveys between 1787 and 1790[9], the Surveyor General reporting

on one of part of the Duab [55], tracing the boundaries of the Vizir's Dominions from the Ganges to the Jumna, the other Mr. Forster's Routes to and from Nagpore; accompanying these Surveys there are Journals, ... and as Mr. Rind has also added several routes to places in the neighbourhood of Nagpore, the whole is a valuable addition to the Geography of that part of the Country[10].

The survey of Forster's route from Cuttack to Nāgpur in 1790[11] was made by James Davidson, commanding his escort; in fact, up to this time, much of the knowledge of the interior of the Peninsula had been gained by officers attached to various political missions. Political officers were often able also to obtain native maps and surveys; when Rind was Assistant to the Resident at Delhi from 1785 to 1787 he was able to get material for a *Map of the Country of the Seiks* [233], and a *Plan of Scindia's Country*, and shortly after, Kirkpatrick sent to Rennell a number of measured routes which he had found at the Emperor's court at Delhi [10 n. 5].

[1] Never separately published. [2] *Ben. P & P.* VI (295), 29–1–85. [3] *Memoir*, 1793 (8–10); Markham (55) reference most inadequate. [4] Ben. Civ.; some time Private Sec to Warren Hastings, and political charge of Chota Nāgpur from 1780. [5] 72 D/16, 73 A/11, 64 J/4 & 64 C/15; Journal, MRIO. M.229 & BM. Addl. MSS. 15588 (115–7); Maps MRIO. 29 (26–35) & BM. Addl. MSS. 29214 (89). [6] BPC. 6–2–84 (19); *Cossids*, Postal Runners. [7] 64 B/6. [8] *Memoir*, 1793 (237). [9] MRIO. 30 (1,31), 168 (30,31) etc., several bearing autograph. [10] BPC. 11–9–89 (7). Journal, BM. 13585 (89). [11] B Pol. C. 25–2–93. Journal BM. 13588 (99 *et seq*) & *v.* Leckie.

WOOD AND KYD, 1786–94

During Mark Wood's short term as Surveyor General the most important occurrence was the appointment in 1787 of Reuben Burrow to make astronomical observations for latitude and longitude at various places from Chittagong on the east to Hardwār on the west [5, 157–62]. Hitherto, surveys had been tied together by such observations as had been taken casually and independently by different surveyors or amateurs, only a few of whom had any real training or experience. In constructing his map of India Call had become convinced of the incorrectness of many of these observations, and it was at his suggestion that Burrow was now employed[1]. Burrow was a skilled observer, and his observations gave a number of master control stations, for which his values were accepted with few changes for next 30 or 40 years [163].

Burrow also made a survey of Cheduba Island [160], and, measured the length of a degree, both in latitude and longitude, near Krishnagar [165–6]. He died in 1792 whilst out on survey.

It fell to Wood to supervise the completion of fair copies and reductions of Call's Atlas of India and he felt convinced that a systematic collection of military route surveys would contribute to fill the many blanks. At his suggestion the following General Order was published;

> It is to be a standing regulation that all Officers Commanding Detachments of the Army, or single Corps, on a march, do keep an account of their daily movements, remarking their computed distances, the towns, villages, and rivers in their routes, the nature of the roads and places of encampment, or any other observations which they may deem material, copies of which are to be transmitted to the Quartermaster General, after the troops have arrived at their destination[2] [196].

This was not particularly new in principle, but was the first published order establishing the practice by regulation. It was not immediately productive, and had to be re-published from time to time; the standard of work sent in was seldom very high, but in course of time several valuable surveyors gained their first experience and training through the routine practice thus introduced.

Kyd, who succeeded Wood as Surveyor General in 1788, had but little opportunity to interest himself in local surveys, as he was continually employed on service overseas. In 1789–90 he made a survey and reconnaissance of the harbours of the Andaman & Nicobar Islands [48–50], and at the end of 1790 he accompanied Lord Cornwallis[3] when he took personal command of the armies operating against Tipu in Mysore; except for Wilford in Benares, all his assistants accompanied him to Mysore [112–3].

A detachment of Bengal sepoys marched down the east coast just as Pearse's detachment had ten years before, but under very much easier conditions. On their way back their route was surveyed by the brigade major, Edmund Wells[4].

At the close of the war two engineer officers, Anburey and Blunt, were deputed to return by a new route through the heart of India, and surveyed a line northwards, through Hyderābād, Berār, and the Central Provinces, to Kālpi on the Jumna, where they arrived in January 1793 [116]. Anburey kept interesting notes on the journey in his field book, which he embellished with charming water-colour sketches[5].

Early in 1793 Kyd was sent to the Andamans as Superintendent of the settlement, and left Colebrooke in charge of the Surveyor General's department.

WILFORD IN BENARES, 1788–94

In 1788 Francis Wilford, who had since 1783 been working on Call's atlas, was sent up-country to survey the province of Benares, under the orders of the

[1] Burrow's Journal; IO. Maps MS. 5. [2] GO. by GG in C. 29–9–88. [3] GG. 1786–93. [4] Journal MRIO. M.196 & 244. [5] Part of Fdbk. GBO. Lib. A.a 41.; Maps. MRIO. 64 (4–17).

Resident, who was engaged in the settlement of the revenues and general re-organization[1]. He completed a survey of the districts north of the Ganges, but his survey of the boundary between Benares and Oudh had to be abandoned in 1794, after delays which will be understood by all survey officers who have been employed on similar duties; he wrote to the Resident in 1791,

Whilst you were on the Coast the disputes on the Boundary ran so high and the behaviour of the Vakeel of His Excellency, who used to get drunk every day, grew so intolerable that I was obliged to represent the whole to the Acting Resident. The Commander in Chief being acquainted with these particulars ordered me back to Benares, there to remain till you return[2].

and the Resident reported that,

Since he [Wilford] has been at this station he has been uniformly employed...either in the general Survey, or the arduous Task of the adjustment of the Boundary between the Honble. Company's and the Nawaub Vizier's Dominions, which two services constituted the object of his being sent into this part of the country. ... Whilst he has made very considerable progress in the former, the obstacles that so long interrupted the Progress of the latter, or the Frontier Demarkation, have at length been so far obviated that the progress which Lieut. Wilford and His Excellency's Agent lately made on the Cawnpore side have been very rapid[3].

Later in the year, however, Wilford reported,

November 27th I went to G— ... there to resume the adjustment of the Boundary; Himut Ali was there with about 300 armed men, but he went away the same day ... without taking the least notice of me.

November 29th, he came, was very civil, and as usual made many protestations of his sincerity toward the speedy adjustment of the Boundary. He hinted several times that he expected a monthly allowance from the Company. ...

December 3rd & 4th I gave out that seeing it was impossible to go on with the Boundary, from the obstructions I met with, ... I was resolved to give it up & go away. ...

December 5th, Himut Ali's Wakil came and said his master was ready to comply; having accordingly summoned the Zimindars of — in the Company's Territories, and of — in the Country of the Nabob Vizier, they appeared and agreed to have all disputes ... settled by arbitration, which took place immediately and the boundary line between the aforesaid villages was settled and traced that very day.

Work proceeded satisfactorily for several days; with the following incident to lighten proceedings,

As the subject of contention was of some consequence, and had been for a long time the occasion of many quarrels and feuds, the Arbitrators, who doubted very much the sincerity of Himut Ali, were in the greatest anxiety, and appeared very unwilling to incur his displeasure by a decision not agreeable to his wishes; I really thought that a stop would have been put to our progress, when a Snake springing from the ground between the Arbitrators to their astonishment and terror, ran away towards the Boundary. The Arbitrators, and the parties themselves, concluding this was a signal interposition of Providence, considered themselves now obliged to abide by the decision of the Snake, and agreed that the Line the snake had described in his flight would be for ever their mutual Boundary. However as the snake had gone over but 3/4 of the Disputed Ground before he disappeared, 1/4 remains to be settled.

On the 3rd and 4th inst., meeting with so many obstructions from Himut Ali, and finding that my colleague the Nabob's Vakeel was a mere Cypher, being without power, without an escort, and totally deserted by the Court at Lucknow, I was really going to give up ... when Himat Ali on reflexion thought proper to Comply; ... the Settlement goes on, and will continue as long as Himat Ali thinks proper, for he is of a fickle disposition. But as soon as we have settled the Boundary round his District, it will be absolutely impossible to go on ... until the Court at Lucknow are forced to adopt more Efficacious measures[4].

At length the Resident was forced to recommend that the work be abandoned and the disputes left unsettled;

The Boundary disputes between this frontier district and the contiguous dominions of the Nawaub Vizier ... induced the Marquis Cornwallis ... to send Lieut. Wilford ... to make a

[1]Benares then covered the present districts of Benares, Mirzāpur, Jaunpur, Ghāzipur & Ballia [35]. [2]From Wilford 10–5–91, BPC. 13–6–94. *Map of the Northern part of the Zemindary of Benares.* 3 miles to 1 inch. DDn. 128 (88). [3]BMC. 25–5–92. [4]B Pol. C. 17–12–92.

survey of, and assist in the adjustment of, a permanent line of Boundary; ... there are so many obstacles continually occurring to the progress of such a demarcation, that ... we have found by experience that it is better to suffer the occasional evils arising from disputed limits, than to incur the risk of the still greater, that arise out of the endeavour finally to decide on them[1].

COASTS OF THE BAY OF BENGAL

The detailed survey of the coasts and islands had now become a matter of extreme importance to the large fleet of sailing vessels maintained by the East India Company [14].

Early in 1779 Dalrymple seized the occasion of the loss of one of the Company's ships, the *Colebrooke*[2], to submit a memorial to the Directors, asking for his appointment for the compilation of nautical charts for the East Indies[3];

Every year shews by the narrow escape of some ship or other, and sometimes by the loss of ships where no danger was suspected, the *importance*, not to call it *necessity*, of such a ***set*** of *Charts*; the Journals at the India-House constitute a noble repository of nautical knowledge, but ... *examining all* the Journals, from the earliest time to the present ... is a Work of infinite labour, and requires not only an unwearied patience, but a certain turn of mind and a degree of experimental knowledge which few men possess[4].

The Directors, accordingly, appointed him Hydrographer from April 1779, and wrote out to India,

Having resolved to use all means in our power to improve the Charts for the security of the Navigation to, from, and in, the East Indies, and being desirous that every person under the Company's protection, conversant in Naval affairs, should co-operate with us in this very useful undertaking; we therefore direct, that you forthwith notify our intentions by publick advertisement. ...

We shall order our supra-cargoes in China to send you annually from thence, a quantity of transparent paper ... to deliver to such persons as may be inclined to furnish copies of Charts and plans already in their possession ...[5] [236, 251–2]

whereupon the Governor General in Council issued the following order;

Public notice is hereby given that the Surveyor General has been directed to receive from the Commanders and Masters of all ships and vessels sailing under British Colours such information as they have acquired during their residence in India, which can in any respect tend towards the correction and improvement of the Charts commonly used[6].

Dalrymple's enthusiasm brought him much material of this nature, and he was enabled to publish many valuable charts and journals, though the old surveyor Ritchie was most scornful of this method of collecting geographical information;

My Journal of a cursory Survey of part of the Coast and Islands of the Bay of Bengal ... was never meant for publication; it is the hasty remarks only, of a running survey ... [16]

Of late it has been the fashion to censure sailor's Journals in the periodical papers, with the utmost rage of critical virulence, and if we might believe these literary Macaronies, it is not the most accurate observer, but the best story-teller who is entitled to wear the garland of public applause; ... it has been observed of late that spontaneous productions of this nature are grown very thin; and it is likely that but few seamen will take much trouble to get themselves laught at for describing broken lands and indented shores in the pointed phrases of their profession, when they know that this must be the case[7].

One of Ritchie's later surveys was a detailed one of Palmyras Point, made "to fix a proper spot for a light-house"[8], and "he is pretty certain that no large river falls in between Pt. Palmyras and the False point[9]", a report which crushed all further thought of the long cherished "Ganga River" [209, 212; pl. 3].

In October 1783 the Bengal Government wrote home,

A proposal was made to us by Capt. Thomas Forrest[10] to undertake a survey of the Andaman Islands, soon after his return from his former expedition. As we had no present

[1] BPC. 13–6–94. [2] Named after Sir George Colebrooke, Director, EIC. [3] Memorial dated 28–1–79. [4] *A Collection of Plans of Ports in the East Indies*; Dalrymple, 3rd. ed. 1787 (27). [5] CD to B. 27–5–79 (51). [6] BMC. 23–5–81. [7] BPC. 6–10–83 (26). [8] Not built till nearly 40 years later. [9] *Memoir*, 1793 (366). [10] Captain of the *Esther* brig.

employment for him at this place, we agreed to accept of his services in that line and engage a small vesssel which he had purchased for the purpose. He left the river in May last[1].

Dalrymple writes,

The intention of this voyage was a Survey of the Andaman Islands, but Captain Forrest left Bengal on the 14th of June, a very improper time for such a destination. ... Capt. Forrest, instead of the Andaman Islands, made the Preparies; went to leeward, i.e. to the northward of Narcondam; and on 1st July saw the Island Tores on the coast of Tenasserim. ...

As Captain Forrest carried with him from England a Chronometer [202], it is much to be regretted he had it not with him on this voyage, as it would have precisely established the longitudes of that part of the Bay of Bengal, which is wanting, viz. from Negrais[2] to Queda[3].

When Wood became Surveyor General he obtained Government sanction to issue fresh regulations for the collection of information about the coasts;

In consequence of the publication from Government for the improvement of the Navigation and Geographical knowlege of India, not a single plan, chart, journal, or paper of any sort has as yet been presented, nor do I believe the desired effect will ever be answered, unless every Commander of a ship sailing from this Port under British Colors is compelled under the penalty of a forfeiture to conform to orders. ...

I have procured several charts of the Eastern Seas, and of the Dutch Islands, which are represented as being of some importance, and procured during the war, at considerable expence[4].

Our first record of Kyd's work as a surveyor is contained in an interesting report on the Arakan coast submitted early in 1785;

An ill state of health having obliged me to go to Chittagong; on my recovery in September last, I was solicited by the Proprietor of Mascal Island[5] to make a survey of the Harbour, as he had been made to believe that it was sufficiently deep to admit ships of War to re-fit and refresh, and to afford Protection for India-men, and as I was not then called upon by any public duty, I thought I could not employ my time better, than in an examination of a matter of such national importance. ... I was, however, much mortified after a laborious survey, to find that it had been taken up on very ill grounds. ... In the course of this survey, accident brought me acquainted with some of the inhabitants of the adjoining Frontier, known to us by the name of Little Arracan, from whom I learnt that there were some very considerable openings in the Coast to the Southward; ... I thought it worth while to attempt the examination. ... I accordingly set off from Mascal in a sloop accompanied by some boats the Rajah sent to conduct and pilot me.

Kyd examined the various inlets and estuaries as far south as "the great Arracan River called the Mau[6]", but he found the whole country up in arms against an invasion by the people of Pegu, and was unable to proceed further south. He concludes

with a great degree of certainty, that there is not any Harbour, on that side of the Bay, where a Fleet could refit, or where vessels of an considerable size could meet with shelter in tempestuous weather, so fit as the port of Chittagong. ...

As I believe the other side of the Bay has never been surveyed, and as far as I can learn is very little known, I have endeavoured during the course of this Business to lay down the line of the coast, and to fix the position of places, as accurately as time and circumstances would admit of, a sketch of which I hope may be of some use to the General Geography of the country[7].

Kyd was next called upon to survey of the island of Penang, which had been acquired from the Rāja of Kedah in 1786, through the agency of Captain Francis Light, who became the first Superintendent[8].

The Governor General acquaints the Council that his desire to have an accurate survey of Prince of Wales's Island and its Harbours has induced him to order Captain Kyd, an officer of Engineers on whose report he can depend, to proceed on that duty[9].

Kyd obtained the services of Robert Colebrooke as assistant, and Colebrooke's interesting diaries are still preserved[10]. He writes,

[1] B to CD. 23–10–83 (19). [2] C. Negrais, 85 L/4. [3] Kedah (Malay States) 6° N. 100° E.; Forrest (preface). [4] DDn. 16 (9), 6–4–88. [5] Maiskhāl I. 79 O/14. [6] Mayu R. 84 D/11. [7] BSC. 12–4–85. [8] Aspinall (191–2) & Swetenham (33). [9] BMC. 28–3–87. [10] DDn. 48, M.511.

On the 15th of April we embarked on board the Tryal Snow[1], a vessel which was fitted out by order of Government for a voyage to Pulo Penang, now called the Prince of Wales' Island.

This place was lately ceded to the Company by the King of Quida. ... It was thought necessary by the Governor and Council to send a proper person to survey and explore the Island, and to collect on the spot every information concerning its harbour, soil, and natural productions.

Capt. Kyd of the Engineers was the gentleman pitched upon for this service, and I was permitted to go with him as an assistant.

On May the 7th they sighted the Coco Islands and the North Andaman; on the 8th they viewed Narcondam, landing there on the 11th, and on May 28th they landed at Pulo Penang.

In about six weeks, the work of surveying the harbour, East side of the Island, the opposite shore, etc. being compleated, Captain Kyd determined upon returning and visiting Quida and Acheen[2] on the way.

Reaching Kedah on July 12th, and Achin on the 20th, they returned to Calcutta on August 12th, 1787.

ANDAMAN & NICOBAR ISLANDS

At the end of 1788 Archibald Blair of the Bombay Marine was commissioned to survey the Andaman Islands with the following instructions,

The Honorable Company's snow Elizabeth having been victualled for six months, and impressed for three, is placed under your orders, and being now in readiness to sail with the Viper, ... you are directed to proceed to sail forthwith to the Southward ... to a survey of the Andaman Islands.

The material object of this survey is to ascertain in what parts of the Islands there are good Harbours, and where it would be most for the Company's advantage to possess one. ... It appears that the most advantageous situation for an Harbour must be near the South end, and to the Eastward of the Island. ... It is therefore wished that you should make the first examination on this quarter; the Board are further encouraged to give you such advice, from a perusal of reports from Mr. Ritchie ... [16–7].

The primary view of this research being ... the acquisition of an Harbour where fleets in time of a war can refit ... on leaving the Coast of Coromandel upon the approach of the stormy Monsoon, or ... retire in the event of a disastrous conflict with the enemy, and obtain a central position in the Bay, ... the following objects occur as necessary to be enquired into: ...

As minute a description as time and circumstances permit to be made of the adjacent Heights, if any, and Ground, the General surface of the Ground ... cultivation ... climate ... timber ... limestone ... mineral productions ... vegetable productions ... animals, birds, or fish not known in other parts...tin and gold ... intercourse with the people. ...

Grounds of contention are to be avoided, as far as possible, with the natives, whose indisposition to every kind of intercourse (Mr. Ritchie's instance excepted) [16] has been attended with acts of Hostility. ... Perhaps after gentle treatment of the Natives while you are at the Island, it may not be impracticable to induce two or three of them to attend you to Bengal, where a further intercourse with the English may lead to the further civilization of the people. ...

It is hardly necessary to recommend to you to ascertain from Astronomical observations, by such instruments as you possess, the position of the places which you visit.

Copies of Ritchie's Journal and Survey...will be delivered to you.

Sulphur—...great importance; ...indispensable ingredient of gunpowder. ... There is great reason to suppose that it may be found in abundance on a small island seen by Capt. Kyd on his return from Prince of Wales's Island and known ... by the name of Barren Island; it was then in the state of Eruption, but circumstances not permitting Capt. Kyd to go on shore, he can only conjecture what the production of the Volcano may be. ...

To proceed to Siddoo Harbour[3] and to examine it accurately on all points[4].

[1] A "snow" was a type of sailing ship; in *CG* of 11–8–85 appears an adv., "To be sold at Public Auction, August 16th, The good snow TRYAL, about 95 tons. A remakably good sailing vessel". [2] Achin, at NW. point of Sumatra. [3] At NW. extremity of Sumatra. [4] BS & Pol. 22–12–88.

On return from his first season's work Blair reported, on May 29th 1789,

The Elizabeth and Viper are arrived in the River, ... the Commands of Government are fulfilled relating to the Great Andaman and adjacent Islands to the best of my judgement.

I afterwards proceeded to Prince of Wales's Island to refit the Viper with a mainmast, to procure assistance for the sick, and such provisions and stock as we were in want of. ... I touched at Acheen and have made there several attempts to examine Siddoo Harbour, but the season ... being too far advanced, ... I judged it improper to persevere. ...

I shall lose no time in preparing a Chart of the whole survey, with particular plans of the harbours and full report on the subject[1].

Blair sailed from Calcutta again in September, and in November reported from Mask Redoubt, Port Cornwallis[2],

The Ranger arrived here Sept. 28th, and the Viper Oct. 27th; ... the Ranger to Carnicobar for a variety of useful plants, Coconuts, Yams, Potatos, and stock; the four latter articles will be highly useful on the arrival of the Squadron, particularly so, should there be any scorbutic Patients[3].

In 1789 a small squadron of His Majesty's ships came out to the East Indies under Commodore Cornwallis, brother to the Governor General, charged with the survey of the islands and coasts of the Bay of Bengal, and reached Diamond Harbour on September 18th[4]; the squadron followed Blair to the Andamans in December, taking Kyd and Colebrooke to survey and report on the harbours. We are again indebted to Colebrooke for most interesting journals and descriptions of the islands and their people[5];

December 23rd 1789, About 4 in the morning we made sail and entered the Harbour called Port Cornwallis at about 8 o'clock. ...

24th. Capt. D. and myself went up the Harbour in a boat to the distance of about 3 miles. We saw upon a rocky point about twenty or thirty of the Natives; they appeared to be quite naked and bismeared with mud. ...

26th. Seeing one of the natives on shore, we stopped a few minutes to hold a conference with him. He was a man of the middle size, tolerably well shaped. His wool was rubbed with a kind of red earth, and the rest of his body smeared with mud. He wore round his neck and left arm a kind of ornament which looked like a fringe of dried grass. He appeared very cautious of approaching us, probably for fear of being siezed; however he allowed Mr. Kyd to draw near him, and readily exchanged his Bow and Arrows for a knife which was presented to him. He had under his arm a small basket into which he deposited everything that was given to him. We gave him some handfuls of biscuit, and in rowing away we saw him sat down on the rock and eat of it with great avidity.

27th. This morning the Ranger Snow sailed for Bengal. ... A native who had been on board of this vessel about three weeks, and who appeared to be perfectly reconciled and pleased with his new mode of living, was left on board of our ship. At the same time the Commodere gave orders that if he wished to go on shore, and return to his countrymen, an opportunity should be given him to desert. He was accordingly put into a Boat and sent ashore. There happened to be at this time a few of the natives in sight, and we desired him to go and join them; he seemed to be actuated by a sudden impulse of joy at seeing them. He sprang out of the Boat, and flung down his Hat and ran towards them; they did not immediately recognize him for one of their countrymen, as he had been cloathed on board ... with a jacket and Trousers. He soon disencumbered himself from his cloaths and returned to that state of nature which he had from his infancy been accustomed to. They immediately seemed to congratulate him upon his safe escape, and they all together ran into the woods. ...

30th. The Lat. of Port Cornwallis by Mr. Blair is 11° 38 30″.

31st. Sailed from Port Cornwallis; ... we shaped our course about South for the Carnicobar Island. ...

January 1st. 1790. About sunrise we saw the land of Carnicobar Island ahead; at 11 o'clock we came to an anchor on the western side of the Island. ...

4th. About 1 p.m. anchored in Nancowry Harbour. There we saw the Danish flag flying. That nation has long had a small settlement at this place. A serjeant and two or

[1]Full Report, dated 10-6-89; BS. & Pol. 3-6-89. [2]Now Port Blair [49] 87 A/14. [3]BPC. 3-2-90. [4]Aspinall (201). [5]Journal, DDn. 10.

three soldiers, 2 old guns badly mounted, a wooden house, and two or three black slaves, composed the whole of their establishment[1].

5th. Sailed up the Harbour in the Atalanta's Pinnace.

6th. The Commodore determined upon leaving the Atalanta with Capt. Kyd and myself to survey Nancowrey Harbour. We moved in the evening. ...

8th. Capt. Kyd began the survey. In the evening we took a walk into the country. ...

March 19th. Sailed from Port Cornwallis. ...

20th. Anchored in the evening at the mouth of an inlet ... which had the appearance of a good Harbour. ...

22nd. By an indifferent observation at Noon our Lat. was 11° 57′ 52″. ...

23rd. This morning we made a survey of the Harbour by taking bearings and angles in different directions and calculating distances by sound from the report of guns and muskets. We rowed out in our small boat to a rocky point at the northern entrance of the Harbour, where we stayed about an hour to make our observations and take views. We saw three canoes with about twenty of the natives coming round a point to the northward probably with an intention to attack us. This enduced us to abandon the rock, and when we got into our boat we fired two muskets in the Air for a signal; ... this appeared to alarm the natives, for they began rowing back immediately. The rock we were upon is remarkably steep, ... we had soundings of 5 fathoms quite close to it. We saw while upon it great numbers of sharks swimming about, they appeared to be very ravenous. ...

24th. This morning we left the harbour, which Captain Kyd called Port Meadows; ...

31st. We sailed up the coast ... and anchored in the afternoon within half a mile of the shore. Captain Kyd and Mr. M. took an airing in the Boat and saw a great number of the natives. They shot about a dozen arrows at the Boat, but not one flew near enough to do any mischief. A couple of musquets fired over their heads induced them to retreat into the wood. ...

April 1st. We stood to the northward along the coast. ...

4th. ... In the afternoon Capt. Kyd and Mr. W. went out in the Boat; they saw one of the natives upon the beach, who called out and made signs to them to come near but it was only with an intention of leading them into a snare, for the boat had no sooner approached within fifty paces of him, than Capt. Kyd perceived a number of men laying in ambush under the mangroves; when they found themselves detected they rushed out and sent a shower of arrows at the Boat, some of which flew over it. ...

5th. We got our water filled up from the Ranger and prepared to leave Andamans for Bengal. ...

7th. ... About 4 miles to the northward of the Saddle Mountain[2] we found another Inlet, which led into a Bay[3] branching in several directions. Mr. Blair with the Ranger and Viper went into it to survey and examine it. We took leave of them and pursued our course for Bengal. ...

18th. In the afternoon we fell in with two pilot vessels and took a pilot on Board. We crossed the Western Brace about 10 o'clock at night and anchored in the Kill. It blew very fresh, and we had a heavy sea all night.

19th. Blowing very fresh from the southward, we crossed the Eastern Brace early in the morning. It was almost low water, and we had an enormous sea with only $2\frac{1}{4}$ fathoms upon it; however we got safely over it, and about 7 o'clock passed the Fairway Buoy. The flood Tide and a strong southwest wind enabled us to get up the river very fast; at 4 o'clock in the afternoon we anchored about 1 mile below the mouth of the Roopnarain River[4].

April 20th 1790. Arrived at Calcutta in the afternoon.

Blair held charge of the settlement for three years at the first Port Cornwallis near the south end of the South Andaman, but Commodore Cornwallis reporting that a harbour in the Great Andaman was far more suitable for the fleet, the colony was moved there in 1792; this new settlement was also called Port Cornwallis, the earlier one being then called the "Old Harbour", and later "Port Blair[5]".

Early in 1793 Blair was relieved by Kyd[6] and returned to his duties with the Bombay establishment after submitting his reports and maps[7].

[1]The Danish Governor at Tranquebar protested "against the action of Commodore Cornwallis in visiting the Nicobar Islands, and making a survey of the Harbour of Nancowry, which has been a Danish possession for the past 40 years", BPolC. 6–8–90. Cf. Topping's account, Bio. Notes. [2]Saddle Peak, 2402 ft. 86 G/4. [3]now Port Cornwallis, 86 G/3. [4]Rūpnārāyan R. 79 B/4. [5]Low. [6]BPC. 12–11–92. [7]Report, BPC. 31–5–93, & *FD Sel.* XXIV; Maps, BM. K. 116 (31). With the maps at the BM. is a series of exquisite coloured panoramas of the coast, mostly by W^m. Test, one of Blair's assts.; his senior asst. on the survey was John Wales [124].

The colony had already been adopted as a penal settlement, and now, owing to the war with France, it was put into a state of defence; large reinforcements were sent, and more guns mounted to guard against possible attack. But in 1794 Port Cornwallis was reported to be unfavourable to the health of the settlers; in the following year 50 deaths occurred among the convicts, and in December 1794 Government reported to the Directors,

> Major Kyd, the Superintendent of the settlement, advised us on his return to it from Prince of Wales Island, that the settlers at the Andamans were more healthy in the last season than they had been in the proceeding one, altho' the rains had been more heavy, ... 123 inches between the 1st of May and the 10th November, which exceeds double what has been observed in the Bengal at any period[1].

After a report from Kyd on the comparative advantages of the Andaman and Prince of Wales Islands, orders were issued in February 1796 for the abandonment of the former settlement, and the removal of the penal colony to Penang. Nothing more was heard of Port Cornwallis till the Burma War of 1824, when the Bengal and Madras forces made it their rendezvous on the way to Rangoon[2].

The next expedition to the Andamans was made in 1858, after which the original settlement Port Blair was re-established.

THE HOOGHLY RIVER

A pilot's survey of the Hooghly is said to have been made annually from 1748 with no great scientific accuracy[3], but in 1765 the Court of Directors wrote out,

> In the course of our Enquiry into the loss of the ship Winchelsea, there appeared great reason to believe that so essential a measure ... as that of an annual survey of your River had been shamefully neglected. ... We positively Insist upon your causing the most exact and careful Surveys of the River to be made once or oftner every year, agreable to our Orders of the 2nd February 1737–8, and 3rd of March 1758[4].

In 1769 the Master Attendant was making regular surveys and soundings with an establishment of five assistant surveyors[5], one of whom was John Ritchie, who found time from his more extensive survey to make several surveys on the Hooghly even up till 1782.

In 1770 Benjamin Lacam brought forward his scheme for a new harbour at the head of Channel Creek, and made several surveys in advocating important improvements in the navigation of the river[6].

From 1779 various Engineer officers were employed on surveys either of special channels or the banks of the river. William Baillie near Hijli[7] in 1779[8]; Mark Wood near Sānkrail in 1780 and 1781[9], & again in co-operation with the Master Attendant down "the Eastern Channel of the River" in 1782. This latter work was under the Chief Engineer, who represented that,

> As there will be a considerable difficulty in making a correct Chart of this passage, and also that the Master Attendant and Pilot are not alone sufficient to give Captain Wood the aid requisite for completing such an undertaking in the manner it ought to be executed, which would absolutely require the joint labour of two or three persons competent in the use of Land instruments. Therefore take the liberty to propose that two or three Gentlemen of the corps of Engineers be ordered to assist[10].

Wood applied for

> boats, people for clearing jungle; Two azymuth, or two Knight's, compasses with sights; a Quadrant; sounding leads, loglines Flags etc.[11]...

but a month later Government report,

> Mr. Ritchie being returned, we have ordered him to make a complete & accurate Survey of the Eastern Channel of the River, instead of that which was to have been made by the Engineers[12].

[1] B to CD. 24–12–94 (38). [2] Low. [3] Long I (xxxii). [4] CD to B. 15–2–65 (17). [5] BPC. 24–7–69. [6] Lacam came to India, a midshipman, in 1760; employed as Dman. & asst. under CE. Ft. Wm.; settled on the Hooghly and devoted himself to development of his New Harbour; HMS. 396 (59 *et. seq.*). [7] Hijli, between Tamluk, 79 B/4, & Kedgeree, 73 O/13; Sānkrail, 79 B/2. [8] BRC. 7–5–79. [9] Map, MRIO. 165 (26). [10] BPC. 14–10–82. [11] BPC. 3–12–82. [12] B to CD. 6–1–83.

In 1788 Archibald Blair, with James Caldwell of the Engineers as assistant, made a survey of the New Harbour and Channel Creek, and also of Diamond Harbour "that the comparative advantages ... might be clearly ascertained[1]".

The survey of the river appears to have been then left to the Master Attendant and the pilots. In 1798 the Surveyor General reported,

I have inspected a set of charts of the River Hooghly from Calcutta to the foot of the Sands, executed by Mr. Wade, a Pilot. From the manner in which the Work has been compiled, the Reaches of the River and the Sands having been laid down by the Eye and not by actual Measurement, it cannot be so accurate as a Geographer would desire....Lieutenant Blunt in constructing a Draught of the River Hooghly for the Commander-in-Chief took the Sand Heads and Shoals from Mr. Wade's Charts, considering them as the best authority[2].

Wade was allowed 3,000 "sicca rupees" for these charts.

Other rivers occasionally called for a survey; in April and May 1782, Wilford was sent out to survey two channels from the great river to Ballia Ghat, near Dacca, which had been reported as navigable[3]; and in 1787 Caldwell was sent to make an accurate survey of the Banka Nullah[4]; as well as to ascertain the annual expence of keeping it navigable[5].

CALCUTTA

The earliest plans of Calcutta were made by engineers for purposes of defence and the lay-out of fortifications, and the following list details some of them;

1742. Two plans of *Calcutta and the Adjacent country*, by Foresti and Ollifrees. Scales 20 and 40 fathoms, or *toises*, to an inch. [Foresti was an Italian engineer, John Aloffe was Surveyor of Works[6]].

1746–47. Sketches and Plans of *Fort William and Calcutta* by Plaisted, who was at that time Surveyor of Works[7].

1753. *Plan of Fort William & Part of City of Calcutta*, with a project for Fortifying the Fort. Scale 100 feet to an inch. Surveyed & Drawn by William Wells, Lieut. of the Artillery Company in Bengal.

[Shows streets and buildings with occupants[8]. Wells was at this time employed as engineer under Colonel Scott, who as Engineer General was then designing the new Fort William].

1757. *Plan of the Territory of Calcutta*, scale 10 inches to a mile, author not known, extending some distance beyond the Mahratta Ditch. Shows the position of the tents and huts of the Nabob's Army in 1756[9] [54]. Seton Kerr describe it as,

"A plan and view of Calcutta in the year 1756, when there were but seventy houses in the town, when the site of a present fort was a jungle, and modern Chowringhee, with other parts of the town, consisted of bamboo groves and paddy fields"[10].

1757. *Plan of Calcutta from Hooghly to the Lake*; shows "The Moors' 1st Camp, February 5th", "2nd Camp", and also the "English Camp"; "to illustrate Clive's attack, February 5th 1757, and Col. Clive's march". [Orme describes it as done for Scrafton, one of the members of Council. The map is merely a coloured sketch in manuscript].

Calcutta appears in some detail in Cameron's *Plan of the Company's Lands and Lakes*, scale 1½ inches to a mile, 1761–2 [13], and also in Martin's *Part of General Survey of the Calcutta Lands*[11], on the one-inch scale, probably surveyed between 1767 and 1770[12] [13].

Martin's survey extends south from Calcutta to the Sundarbans, with a small area to the west of the Hooghly from Ulubaria to the Dāmodar. It is a careful topographical survey, showing village sites and names, salt-works, roads, creeks, protective embankments, *pargana* limits, tree symbols, and elevated land.

Beyond the limits of survey are notes—"Part not Inhabited Where a quantity of Salt is made"—"Land not Inhabited call'd SUNDERBUND, full of Woods Creeks & Rivers & where a great quantity of Salt is made".

[1]B to CD. 10–3–89 (119) [2]BPC. 21–1–99 (17). [3]BPC. 8–4–82 (24). [4]At the head of the Mātla R. 79 B/11. [5]BPC. 28–10–87. [6]BM. K. 115 (40, 41) [7]Orme MSS. 147 (35) & 333 (15). [8]MS. copy, BM. K. 115 (42); printed in SGO. Calcutta about 1868, VM. exbt. 1743. [9]No MS. found; printed copies, Orme, III; Seton Kerr. IV (pocket); VM. exbt. 1734; proof, HMS. 773 (893). [10]Seton Kerr, IV. (preface). [11]MS. Orme MSS. 333 (14). [12]Printed copy, IRD. Lib.; MSS., MRIO. 52 (5–8); for rejection of dates suggested on MRIO. label *v.* Bio. Notes, *sv.* Martin.

When in 1800 the Surveyor General prepared a map of the environs of Calcutta, he used the whole of this survey of Martin's without correction, extending it by Cameron's skeleton survey and various route surveys.

There is at Calcutta a survey by Richard Parrott, of the Engineers, of *Budge Budge and the Hooghly River* on the scale of 400 feet to an inch, which must have been made before Parrott's death in 1772[1].

In 1780 Government appointed Commissioners of Police for the administration of the city[2], laying down amongst other things that it was

necessary for the Convenience and for the Preservation of the Health of the Inhabitants of the said Settlement that the stagnant Water should by proper Drains & Channels be drained from the said Settlement, and the Filth, Dirt, and Rubbish removed therefrom...

and also that "a Registry of Lands, Houses and Estates" should be prepared, and suitable names suggested for all streets and lanes.

Edward Tiretta was appointed Surveyor to the Commissioners on a salary of Rs. 1,000 a month, and

required to survey the said Streets, Lanes, and Passages, and to report...whether any additional Drains and Sewers are wanted, ...and...at the same time report the State and Condition of the Roads. ...

He was also to be responsible for the disposal of refuse, and control of brick kilns. His responsibilities were obviously heavy, and in August 1781 he writes,

In the month of January last you were pleased to grant me assistants in order to make a Survey of the Town and the Limits thereof, as also an establishment for an office. ... In consequence of this grant, part of the Town has been surveyed and delivered in to you, and in the Month of April you were pleased to strike off the whole of that Establishment, since which time it has been totally out of my power to go on with the Survey without such assistants, it not being possible for any one man to perform such work by himself alone. ...

Should you think proper to have the survey and the Levels of the Town proceeded on, ... you will be pleased to grant me such assistants, and such persons as may be necessary. ...[3]

and again three months later,

Levelling, especially in large towns where the sight by the vicinity of Buildings is continually confined to very short distances, is not only a complicate but a very tedious and Laborious work, the more in this Country, where, from the heat of the Climate, those who are employed on such duty can work but a few hours in each day; from this circumstance it is impossible for me to ascertain with any probability the time it will take or expence which will be accrued.

Respecting the Survey it is my opinion that with assiduity and proper assistants this work might be accurately performed in the course of two years, the probable expence attending which I compute to Rs. 24,000[4]. ...

The Commissioners of Police asked Government to grant them financial assistance, "our present funds being very inadequate to so expensive an undertaking", but it was decided to call on the Chief Engineer to depute two Engineer officers to make the necessary surveys, and nothing further is heard of Tiretta's work. No survey had been delivered by January 1784 when the Commissioners wrote in,

Having been frequently obliged to proceed in the dark in the Execution of many of the Public Works for want of a General Level of the Town, and conceiving that to continue without it may be attended with a Waste of Public Money, and understanding that there is Plan, Survey and Level, of the Town lodged in your Public Department, ... we beg the favour to be allowed to copy it. ...[5]

Reference was thereupon wrongly made to the Surveyor General, who had to reply,

I have none other than that which is delivered in the printed maps of Major Rennell: the Chief Engineer has I believe a particular plan of the Town and Environs of Fort William lately laid down at a large scale by Captain Robinson, Garstin, and other officers, a copy of which was never sent to my office[6].

[1]MRIO. 49 (15). [2]BPC. 26-6-80 (726-99); Regulations pub. [3]BPC. 1-2-81. [3]From Tiretta to the Commissioners of Police 21-8-81; BPC. 4-9-81. [4]BPC. 24-12-81. [5]BPC. 2-1-84. [6]BPC. 5-4-84.

In May, however, the Commissioners appear to have made touch with Mark Wood and his officers, reporting "that they have asked Capt. M. Wood to prepare plan, survey, and levels of Calcutta. ...[1]"

Garstin writes of this survey in 1808,

Four Engineer officers were employed for near three years on a Survey of the Town; it was scarcely completed, when great alterations that had then taken place called for a new one; and I was employed for about six months in surveying one small division, and that the least crowded with buildings. ... It is impossible to survey the streets of so populous a place except for an Hour or two in the morning, before they are filled by the inhabitants[2].

The survey was on the scale of 200 feet to an inch, and showed every house and tank; the maps were completed by 1786[3].

The reproduction of copies of a large-scale city map is almost as arduous a task as the survey, and no full scale copies of Wood's survey are now known. In 1791 Wood, now Chief Engineer, recommended that copies should be engraved on a reduced scale by William Baillie, a retired officer of Engineers;

A few years ago I made a Survey of the Town of Calcutta for the Commissioners of Police; at which time it was intended to have named the different streets. ... By some accident, the Naming of the Streets has never taken place, and as there is no copy of the Survey, in the course of a very few years...it is more than probable that the Considerable Expence of this Survey, as well as the Trouble attending it, would be entirely lost to the Public.

With a view of preventing this, I took it upon me to promise Mr. William Baillie ... every support and assistance towards executing an Engraved plan ... on ... a reduced scale ...[4]

As in the course of Five Years, Calcutta has undergone some considerable alterations, the Plan would be more correct were your Honourable Board to admit of my employing an Engineer Officer to insert in the Plan such alterations, which would not occupy a longer space of time than two months. ...

The subscription is only Twenty Rupees each copy[5].

Government approved and "to assist the police" subscribed for 150 copies, which Baillie delivered in December 1792, writing,

I have endeavoured, tho' in vain, to get impressions thrown off equal to my wish, as the Workmen of this Country are as yet very inexpert in Copperplate printing, especially in Works such as the present, where the plates are much laboured, and the Work close and crowded. ...[6]

Wood was very disappointed with the style in which the job was carried out,

Mr. Baillie has in no respect executed the Plan of Calcutta in the Manner which he ought to have done. ... Had Mr. Baillie only taken the trouble to have made a correct copy of the Plan on a reduced scale, a business to which I know he was very equal, the Engraver would have found no difficulty in executing the work, in place of which he has merely traced the streets and Lanes, and even this small part of the Work, I fear, was not done by himself, and filled in the intermediate space with black lines, which renders the Plan of no sort of value. ... Had he even represented the principal Houses and Tanks he would have been more excusable. The Chowringhee and [European] Quarter has been executed in the manner that the whole of the plan ought to have been[7].

On receipt of this report the Board declined to pay the balance due on the 150 copies, having advanced one third of cost.

Baillie's own advertisements of the map are of interest:

Mr. Baillie's plan is now ready for delivery. He has waited many months in the expectation that the streets in the Native Part of the Town would have received new names, as those in the European Quarter have lately done. ... [The Plan is] 35 inches by 14 inches, accurately reduced from the large one in possession of the Commissioners of Police, and points out all streets, lane ghauts, etc. It shows all public buildings, but private buildings though on the original map, scale $26\frac{1}{2}$ inches to a mile, cannot be shown on the reduction, which is little more than $6\frac{1}{2}$ inches to a mile.

Price 25 sicca rupees mounted on roller, or 20 if pasted on cloth at the Free School.

N.B. The ground and new buildings at Chowringhy, south of the Burial ground are taken from an accurate survey made last year[8].

[1] IO. Copies, 1784 (34–8). [2] DDn. 81 (47) of 25–11–1808. [3] B to CD. 18–8–91 (159). [4] 800 feet to an inch. [5] BPC. 30–3–91. [6] MS copy, with copies of the engraved map MRIO. 43 (4); BPC. 5–12–92. [7] BPC. 28–12–92. [8] *CG.* 29–11–92.

and again;

Gentlemen may be supplied with good Impressions—not mounted—at reduced price of 10 sicca rupees by application to Mr. Baillie at the Free School[1].

In addition to the survey for the Police Commissioners, the Engineers made other large scale surveys for military purposes, of which the following are still preserved;

By Edward Robinson.—*Survey between Budge Budge Road and the Hooghly.* Scale 8 inches to a mile. 1780[2].

By Mark Wood.—Three maps signed by Wood, which may not have been entirely surveyed by him alone; he probably incorporated the police map with his own surveys;

First.—*Country on the banks of the Hughly R. from Calcutta to Ooloobareah,* including the Fortress of Fort William and works at Budge Budge, also representing the *Soundings* of the river at low water in Spring Tides. Surveyed between 1780 and 1784. Scale about 2000 feet to an inch.

[This map is beautifully drawn with elaborately coloured ornamentation, cultivation, and tree symbols. It shows the Hooghly from Chitpore to Jugdispoore on the right bank below Budge Budge, and the country up to 3 miles on each side of the river].

The second and third maps cover a similar area on the scale of 4 inches to a mile; drawn by Wood in 1785; surveyed January to May, 1782 and 1783. One of them is inscribed,

To Lt-General Sloper Commander-in-Chief of the forces of India, this Survey of the Country in the neighbourhood of Fort William, which was originally intended for military information, is presented[3].

Calcutta was growing fast, and Baillie's map did not long meet requirements. In October 1791 Aaron Upjohn, who had been Baillie's printer, "commenced a Survey of Calcutta and its Environs", which he completed and mapped on the scale of 8 miles to an inch; the map was sold for sixty rupees a copy and Government took forty copies.

The boundaries of Calcutta were shown both in Baillie's and Upjohn's maps, and were officially proclaimed shortly after the publication of the latter[4].

A copy of Upjohn's map is preserved at the Surveyor General's Office in Calcutta; it covers an area from Chitpore to Alipore, and is entitled,

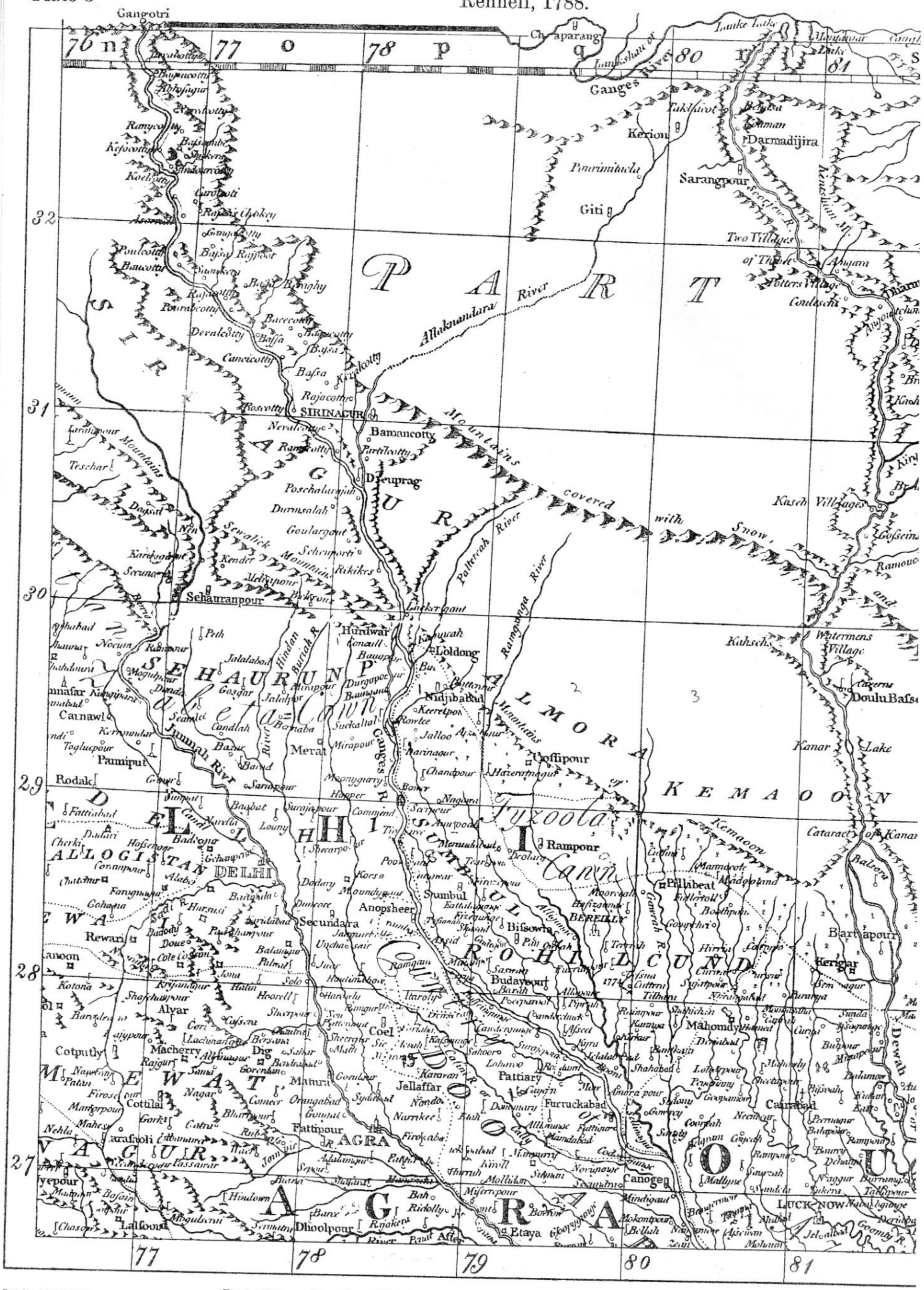
Map of Calcutta and its Environs. From an accurate survey taken in the years 1792 and 1793 by A. Upjohn [and bears a note] Plan of the Territory of Calcutta as marked out in the year 1742; exhibiting likewise the Military operations at Calcutta when attacked and taken by Serajuddowlah [249 n. 1] on the 18th of June 1756 [51][5].

[1] *CG.* 23–5–93. [2] MRIO. 49 (14). [3] BMK. 115/37, 38, & 39. [4] Blechynden (128). [5] MRIO. 43 (10–12); also Seton Kerr, I (pocket).

Plate 6

The GANGES and the GOGRA

Rennell, 1788.


Gangotri
Chaparang
Ganges River
Takliot
Kerion
Darmadijira
Sarangpour
Giti
Two Villages of Thibet
Allaknandara River
Mountains covered with Snow
Kasch Villages
Sirinagur
Bamancotty
Dieuprag
Poschalumjah
Durmsalah
Goulargaut
Schemporti
Rekikra
Sehauranpour
Hurdwar
Loldong
Nudjibabad
Meerut
Jumnah River
Rampour
Anopsheer
Secundara
Bisowra
Budayoun
Furruckabad
Canoge
Mahomdy
Pillibeat
Bareilly
Kemaoon
Cataract of Kanar
Lake Kanar
Doulu Bafs
Watermens Village
Kahsehs
Ramouc
Lucknow
Agra
Dhoolpour
Etaya
Lallsoun
Alwar
Macherry
Cotputly
Rewari
Pamiput
Rodak
Carnawl
Delhi
Allogistan Delhi
Hindan R.
Burrah R.
Ramganga River
Palteeah River
Kanar Lake
Tyroola
Almora
Sehaurunpur
Doab
Rohilcund
Oude
Mewat
Jyepour
Lassarar
Hindown
Mogulsarai
Agra
Kemaoon
Tyroola
Almora
Rohilcund
Oude
Delhi
Mewat
Agra
Sehaurunpur
Doab
Jyepour
Lucknow
Allahabad
Benares
Gorackpur
Dewah
Baharaich
Kerigar
Bisolvalt
Bhartapour
Mahomdy
Cauzabad
Furruckabad
Pattiary
Jellaffar
Coel
Dig
Cottilai
Fattipour
Agra
Canoge
Mindigaut
Etaya
Dhoolpour
Lallsoun
Yepour
Alwar
Macherry
Cotputly
Rewari
Pamiput
Rodak
Carnawl
Meerut
Rampour
Anopsheer
Secundara
Bisowra
Budayoun
Pillibeat
Bareilly
Kerigar
Bhartapour
Mahomdy
Cauzabad
Furruckabad
Pattiary
Jellaffar
Coel
Dig
Cottilai
Fattipour
Agra
Canoge
Mindigaut
Etaya
Dhoolpour
Lallsoun
Lucknow
Allahabad
Benares
Gorackpur
Dewah
Baharaich
Kerigar
Bisolvalt

CHAPTER IV

BENGAL SURVEYS, 1793 TO 1800

Beyond the North-West Frontier — Chittagong Frontier, 1794 — Chunār to Rājahmundry, 1795 — Ganges–Hooghly River Passage, 1777–96 — Ganges River above Cossimbāzār, 1796–1800 — Special Surveys in Calcutta, 1795–6 — Chittagong Coast, 1799–1800.

BY the time Colebrooke became Surveyor General in 1794 political anxiety had definitely shifted to the country beyond the western frontiers. The Mughal Emperor at Delhi was a prisoner in the hands of the Marāthas, who were pressing on the frontiers of Oudh and of the Company's smaller neighbours on the west.

In 1793 Timur Shāh of Kābul had marched down to Attock[1] but had died there just as his army was preparing to cross the Indus. He was succeeded by his ambitious son Zamān Shāh, and to forestall possible danger to the Company's provinces it appeared essential that strong support should be given to the Wazīr of Oudh, and that as much information as possible should be collected about the countries to the west.

Government therefore welcomed the offer of Charles Reynolds, surveyor to the Bombay Government, to make a survey of the upper part of the Ganges–Jumna *doāb*[2];

> The object of his proposed researches...are the Provinces in the Duab, and he means particularly to take a northerly direction, into parts which have hitherto been little explored. For this purpose he has obtained the acquiescence of Mharajah Scindiah without any application or Intimation from this Government. The object of his proposed surveys are principally in the Dominions of that Chieftain. ...
>
> That he be allowed an assistant, and that the Commander-in-Chief be requested to give permission to Ensign James Blunt to act upon this service[3].

Blunt joined Reynolds at Allahābād in December 1793 and they ran their survey through Meerut and Delhi, paying a visit to the Emperor [301–2], and continuing as far west as Pānīpat[4], thence returning by Hardwār, and through Rohilkhand to reach Lucknow in May 1794, when the party dispersed, and Reynolds had to return to Bombay[5] [132].

Later in 1794 followed the disturbance in Rampur State, which led to the second Rohilkhand War, and the Surveyor General replied to a request for a map,

> I do myself the honour to transmit...for the use of the Commander-in-Chief, a sketch of Rohilcund, in which the principal places are laid down from the astronomical observations of the late Mr. Reuben Burrow. The rest is partly drawn from the Authority of Major Rennell. ... I regret much that we have not more particular survey of the Province and that the country beyond the Hills bordering the Rampour District[6] is totally unknown.
>
> It is much to be wished that an officer might be appointed to act in the capacity of a surveyor during the campaign[7].

The Commander-in-Chief appointed James Mouat, of the Engineers, to take "an accurate survey...of Rohilcund and in particular of the Jaghire of Ahmat Ally Khan[8]", specifying "as the first and leading objects",

> To trace the Ram Gunga from hence[9] to the hills, carefully examining its fords, with their depth of water at different seasons of the year.
>
> To examine all the passes in the hills, from the Hurdwar to the south-east confines of Rohilcund.

[1] 43 C/1. [2] Land between two rivers. [3] GG's min., BMC. 8–11–93. [4] 53 C/15. [5] Blunt's Fdbk. MRIO. M. 541; Rough Protractions, MRIO. 30 (61–66). [6] Rāmpur, 53 P/1. [7] DDn. 16 (54) of 16–10–94. [8] The infant Raja now established as Chief of the Rāmpur State. [9] Bareilly, 53 P/7.

When these objects are attained... you should survey the new boundary of the Rampore Jaghire, and the roads leading between the principal towns and forts in Rohilcund, and in particular to investigate by what route an army might march from Oude and from our stations, to Cossipore[1] and Afzulghur[2] leaving Bareilly and Rampore on the left. ...

You will return by the way of Islaulabad, which route from thence to Bareilly has not yet been accurately examined[3].

Mouat took up this work from December 29th, and a year later the Surveyor General sent him further detailed orders as to the routes he should follow, with the principal object of gaining "some knowledge of that part of Rohilcund which has never yet been explored by any European[4] [188]". By 1796 Mouat had sent in

—a survey of the Ram Ganga from Bareilly to the Hills[5];

—a survey of the Commow[6] Hills from the Efflux of the Ram-Gonga at Cally-Goutha to Hurdwar, scale $2\frac{1}{2}$ miles to an inch. [A strip about eight miles wide along the foot of the hills which are shown conventionally with their limits, and the limits of the forest area and the larger rivers][7];

—a survey of the boundary of the Jaghire of Ahmad Ali Khan, scale 3/4 of an inch to a mile. "The boundary was ascertained by people deputed on the part of the Wazier and Rohillas respectively[8]".

It is notable that though the Surveyor General writes that

"we are quite destitute of information respecting Rohilcund and indeed of all the country from Futtehghur and Anopshaire[9] to Hurdwar"[10],

yet Reynolds sent no copy of his survey of 1793–4 to Bengal, until it was specially asked for it in 1797 [55, 255]. Valuable information had, however, been coming in from another source. Dr. William Hunter who was "Assistant Surgeon to the Residency with Maharajah Scindia", had a bent for survey, and as the Marātha Court wandered from place to place in camp fashion during the year, he took astronomical observations and measured the routes.

The first route thus surveyed by Hunter was that followed by the Resident, Major Palmer, when travelling from Agra to join Sindhia at Ujjain

by way of *Gwalior*, through a circuitous road, because it lies through countries where Sindiah's Passes would be respected.

On the 23rd of *February*, 1792 we marched from Agra, ...29th Gwalior...March 11th Jhansi...29th Bhilsa...April 3rd Bhopal...15th Oojein[12]. Remained at Oojein from the middle of April 1792, till the middle of March 1793. Left Oojein March 14th 1793...22nd Muckandra...25th Kotah...April 4th Rampoora...20th Fattehpoor-Sicri...21st Agra[11].

On his return to Agra Hunter met Reynolds who had recently brought a survey up from Hyderābād [132], and was much pleased to find his routes appreciated by that experienced surveyor;

Being persuaded that a delineation of Major Palmer's Routes to and from Ougeine[12] will be conductive to the improvement of Indian Geography, and farther encouraged by the opinion of Capt. Reynolds, ...I beg leave to offer that Survey for the public service. ...[13]

Reynolds's comments on Hunter's routes were,

The surveys have the greatest claim to attention from the accuracy with which they appear to be laid down, ...and from the great number of Actual Astronomical Observations which you have made.

The survey from Futtyghur to Agra...is entirely new, and has always appeared to me to be very much wanted.

The Route from Agra to Ougein by Gwalior is also of much consequence, altho' in many parts it is in the same tract which was surveyed by Lt. William Stewart in his way to the Deckan [116]. The principal merit of it is...the number of good Astronomical Observations, and the important route which completes the line from Bopaul[14] to Oogein, & of which we were before ignorant, except from report.

Your return from Oogein by way of Boondee[15] is of the utmost consequence, as laying thro' a tract of which we had no information...thro' the very centre of Malwa[16], the

[1] Kāshipur, 53 K/16. [2] Afzalghar, 53 K/11. [3] BPolC. 16–1–95. [4] DDn. 16 (63), Dec. 1794. [5] Maps, MRIO. 169 (2–5); DDn. 16 (99), 21–11–95. [6] Kumaun. [7] MRIO. 15 (29). [8] MRIO. 15 (1). [9] Fatehgarh, 54 M/11; Anūpshahr, 53 L/7. [10] DDn. 16 (119), 14–4–96; [11] *As R.* VI 1799 (13 *et seq.*). [12] Ujjain, 46 M/16, one of the most ancient of Indian cities, first meridian of Hindu astronomers. [13] MRIO. M. 574, Hunter to Govt. 14–5–93. [14] Bhopāl, 55 E/7. [15] Būndi, 45 O/11. [16] Mālwa is the plateau lying in west part of the Central India Agency, 45 SE. & 54 SW., 46 NE. & 55 NW.

geography of which will now be completed by your survey, and the assistance of the route I shall take on my return[1].

The following season Hunter sent in another survey, this time from Fatehgarh to Lucknow, and

detected many errors in the position of places as laid down in Major Rennell's map, and... inserted towns and places of some note, that have been entirely omitted. ... The extent of his survey in Road distance is 330 miles. The places ascertained by Astronomical Observations are seventy in number[2].

Government awarded him a sum of 2,500 rupees as compensation. In both the following seasons, 1794–5 and 1795–6, Hunter made similar surveys, which were much appreciated[3]. It should be noted that this class of survey was of a much higher standard than that carried out by Rennell's surveyors, the astronomical control was closer, and all the distances were measured by perambulator; there was still however no attempt made to complete the survey of a definite area in detail; maps were still mere skeletons.

In 1795 the Surveyor General obtained permission to send James Hoare to survey the Jumna River [188];

As no good survey has yet been made of the Jumna River [38], I would recommend his being sent to explore it, from the confluence at Allahabad up to Delhi, or so far beyond it as he might with safety proceed. That the object of his deputation should be, not only to ascertain the course, depths, and windings of that River, but also to insert in his plan all the Towns, Forts, and villages on its banks, marking also the places where Ferries are established, and those where the river is, at any time, fordable. He might likewise be directed to ascertain the Mahratta Boundary in that quarter more correctly than has yet been done[4].

Hoare completed the survey up to Agra in his first season, and carried it on to Delhi during 1796–7, spending some time in making good observations for latitude at both these places; his health however broke down, and he was not able to make the necessary fair copies of his journals and fieldbooks which the Surveyor General required [197]; he was recalled in May 1797 and died the following year. In submitting fair copies of his charts to Government, the Surveyor General remarks that,

As these charts have been laid down from measurements by a perambulator, and bearings taken with a compass throughout, ...there is reason to believe that although the more nice operations with the theodolite and sextant had been almost entirely omitted; ...they will nevertheless furnish data for inserting the course of the Jumna in the maps with a greater degree of precision than has hitherto been done. ... The third sheet from Agra to Delhi is the more valuable, as that part of the river Jumna had not I believe ever been surveyed before[5].

It falls to most surveyors that their labours should be criticised in after years [6], and the following comment on Hoare's work was made only 12 years later;

I am led to think the obstacles to the navigation of the Jumna may be removed at a very moderate expence. ... A correct survey of this river is much to be desired. That done some years since by Captain Hoare being of little value, as it is replete with errors; no sort of reliance is to be placed on it[6].

Early in 1797 great alarm was caused by Zamān Shāh's invasion of the Punjab, and threat to advance on Delhi [55]; and Colebrooke, with a keen sense of his duties as Surveyor General, wrote,

I take the liberty of suggesting that a survey of the upper part of the Dooab might be found to be of the highest utility and importance, in case of that country becoming at any future period the seat of war, and the late inroad of Zemaun Shaw into the Punjab would appear to render such an event not altogether improbable[7].

Accordingly in 1798 Thomas Wood was sent up to join Sir James Craig's army in Oudh in the capacity of Surveyor, whilst the Governor General sent General Craig instructions for the protection of Oudh against a possible attack by Zamān Shāh, who crossed the Indus, and arrived at Lahore with a large army[8]. The alarm caused by this intelligence was all the greater because of the war that was then in preparation against Tipu of Mysore. The strain was relaxed when it was learnt

[1]MRIO. M. 574. 15–5–93. [2]Letter from SG., DDn. 16 (44), 22–3–94. [3]Maps, MRIO. 30 (3) and 31 (43–47). [4]DDn. 16 (80), 1–4–95. [5]DDn. 14 (127), 28–9–99. [6]DDn. 81 (27), Garstin to QMG. 5–7–1808. [7]DDn. 16 (33). 11–5–97. [8]Martin, I (261 363, etc).

early in 1799 that Zamān Shāh had started to withdraw owing to bad news reaching him from Herāt.

Wood was first employed on surveys in the eastern provinces of Oudh,

> I think... that a survey of Gorrakpore and Baraitch[1] will be authorized. It is really much wanted, for we know nothing whatever of the country. What are called in the map, "teak or saull forests" is a fine level cultivated country to very near the hills. The Boorah Raptee[2] is laid down at mere random, and I sincerely believe the whole has been manufactured from harcarrah reports & such information[3].

Again, after reporting various routes that he has surveyed; ... the first three of these routes are not in any of our maps that I have seen, and the two last will I hope be found not only more correct, but very much more particular than what we now have, as I took in, by cross bearings, every town and village I could see to the right and left. ... There is much information relative to the interior divisions of the country which I might obtain from the public officers at Lucknow, and would most willingly be afforded, as I am authorized by the Resident to say that the Nabob, so far from having any objections to the survey being continued, is on the contrary very desirous of it[4].

For the next season, 1799–1800, Wood was directed to survey

> a route from Cawnpore to Baraitch, and thence along the foot of the hills to Hardwar, from which place he is to return along the Ganges with a view to examine the different fords, and to survey the river to Ramgaut[5] below Anopsheir... as the Ganges from Ramgaut down to Cawnpore has never been accurately surveyed, and may even have shifted its course considerably... since it was laid down in the maps, Lt. Wood should be directed to continue his survey of the Ganges down to Cawnpore[6].

Wood's report on this survey starts with an apology for not sending a copy of his fieldbook to the Surveyor General each month,

> That was a thing totally out of my power, my time being so completely taken up by my survey that I seldom, if ever, got in to my tent sooner than three or four in the afternoon, and frequently not until Sunset. I will now take the liberty to acquaint you of what I have surveyed during the fivemonths I have been absent; ... many parts of my track... were through jungles where I am certain no Human being ever was before, and that it is still a matter of surprize to me how I did pass without any accident to the people who were with me, as the number of Tigers is really incredible. I commenced my survey at this place [Cawnpore] and proceeded to Lucknow. From thence I went in about a westerly direction, ... Khairabad[7], ... up the Western side of the Gograh as far as Durmahpoor[8], ... further than which I could not penetrate, on account of the Forests etc. ... I proceeded towards Peeleebeat[9] passing... many other places not inserted in any of our Maps; from Peeleebeat I went up to Nahnick Muttah[10] and here my progress to the Northward was again stopped by immense Forests. I therefore struck off to the westward, and passing through... Kasseepoor... I arrived at Afzool Ghur[11], from which I went through the Forest to Kallah Ghattah, at which place the Ram Gungah issues from the Mountains.
>
> From this I made an attempt to pass to the Westward... keeping betwixt the Forests and the Mountains; I very soon however found that this was not to be done. ...
>
> I was a little difficulted about the Route... for the accounts I received as to the practicability of the road through the Mountains from Loll Dong[12] to Hurdwar were very contradictory; ... however... I determined... to make the attempt and... succeeded, having reached Chandieghaut on the Ganges (and immediately opposite to which is the town of Hurdwar) the fourth day after reaching Nudjeebabad[13]. ...
>
> Though I did not exactly know what sort of reception I should meet with from the Seiks and Goojers who inhabit the Western Bank, yet I determined to make the trial, and passing over to Hurdwar I surveyed down that side... a distance of... fifteen miles, at which I recrossed without the smallest objection having been made. ... I came down the eastern bank of the Ganges to Asophghur[14]; ... from this I surveyed the country for a considerable way inland. ... The whole of my Land Survey comprizes and extent of upwards of 800 miles in which every bearing is taken with a Theodolite to a minute of a degree. ... I have surveyed the Ganges in the most particular manner from Hardwar down to this place, amounting by its windings to... upwards of 400 miles. I have examined every Ford and Ghaut betwixt Hurdwar and Ramghaut, besides this there are particular plans of various Forts etc., to do which you must well know takes a considerable time; ... during my Survey I have taken at least 180 observations

[1] Bahraich Dist. 63 E. [2] Rapti R. through Gorakhpur Dist. 63 N. [3] DDn. 15 (69). April 1799. [4] DDn. 15 (81). 6–6–99. [5] Ramghāt, 53 L/8. [6] DDn. 14 (135), 14–11–99. [7] 63 A/14. [8] Dharmanpur, 62 H/4. [9] Pīlībhīt, 53 P/14. [10] Nānakmata, 53 P/13. [11] Afzalghar, 53 K/11. [12] Lāl Dhāng, 53 K/5. [13] Najibābād, 53 K/8. [14] Gojhia (Asafgarh), 15 m. S. of Hardwār.

for Latitude; 20 for... magnetic variation, and 19 for the Emersions or Immersions of Jupiter's Satellites for Longitude; ...I think I am not much wrong in saying that very few Surveyors in this Country ever did so much in the same time, and without any assistance whatever[1].

CHITTAGONG FRONTIER, 1794

Other surveys of this period include surveys made by Thomas Robertson in Chittagong, under instructions from the military officer commanding. In July 1794 he submitted

the survey of the Southern Frontier of this Province, ...but have to regret that from the advanced season of the year, as well as the impenetrable nature of this country, it being chiefly Hills & Forests etc,, I have not been able to render the survey so complete or so extensive as I could have wished, ...its having been out of my power to trace the course of the Naaf River[2], but the Banks of this River are so covered with Forests as to be impenetrable to a single person, and of course impracticable to carry a series of measured lines along them; neither was it possible to proceed by water, as Boats were not to be procured[3].

His survey lay from Maiskhāl Island[4] to the mouth of the Naaf River.

During season 1799–1800 William Parker of the Artillery ran a survey from Ramu to Ukhia Ghaut[5] on the Naaf estuary.

CHUNĀR TO RĀJAHMUNDRY, 1795

Early in 1795 a survey of particular importance was made by James Blunt from Chunār[6] to the East coast; in recommending which, the Surveyor General wrote,

As his route would lay through a tract of country never yet traversed by Europeans, our Geographical knowledge would be considerably increased by such a survey. ... There does not occur in Major Rennell's map the names of more than three or four places in the whole track he proposes to explore, being in length nearly 500 miles.

In a political point of view this survey might...be considered as an object of the highest importance, as it would lead us to the knowledge of the native powers inhabiting those hitherto unexplored regions.

It would furnish a route, and it might be hoped ultimately, a high military Road, leading from the extreme point of our Dominions in Bengal to...our Territories on the coast, forming a more direct channel of communication for succours, supplies, or intelligence than any we yet know. ... The whole distance might be marched in fifty days provided no extraordinary impediments occurred [41][7].

Government granted their approval;

The necessary passes from the Rajah of Berar have now been obtained; ...as however the Nagpoor Government might be jealous of his surveying any part of its dominions, you are to direct him to be particularly circumspect during his route thro' Berar, that the object of his commission be executed with a caution to prevent suspicion. ... The Commander in Chief will be requested to order an Escort of a Jemadar and 30 sepoys to accompany Ensign Blunt from Chunar, and the Military Paymaster General will be instructed to give orders for an advance of three months allowances for himself and the Escort.[8]

The Surveyor General's detailed instructions to Blunt read,

The most likely way of attaining that desirable end will be to set out from Chunarghur in a southerly direction, and not to deviate materially from that course until you reach Cossimcotta[9] in the Northern Circars, or any other place of note in the Vizagapatam District. But as a variety of natural impediments might occur on the way, ...you will...perhaps be obliged to alter the direction of your march by a few points of the compass. ... The propriety of such a direct course will appear the more obvious as it is the object of Government to establish a communication between the upper provinces and the Circars, and to find a road by which an Army might upon any emergency march with ease and expedition [41].

[1]Wood to SG. 30–4–1800; BMC. 14–12–1807. [2]84 D/5. [3]BPolC. 8–8–94. [4]79 O/14. [5]84 C/3 & C/4. [6]63 K/16. [7]DDn. 16 (50), 1–8–94. [8]BPolC. 28–11–94. [9]Kasimkota, 65 K/14.

Wishing you every success in your undertaking and that you may gain every credit and reward that will be due to your labours[1].

It is easy to understand the interest Colebrooke took in such an enterprise, when his experiences with Colonel Pearse's detachment on the east coast route are remembered.

Blunt left Chunār on January 27th 1795, with a party consisting 150 men, women, and children, his sepoys, servants, and their belongings. His route lay southwards across the Son, then through the hilly country along the borders between Mirzāpur and Rewah[2], over the difficult passes of Korea and Surguja[3], into the fertile country of Bilaspur and Raipur[4]. Reaching Kānker[5] he had to turn west to avoid the inhospitable country of the Khōnds, and after following the Wainganga River made another abortive effort to work his way through to the east coast. But it is better to tell his story by extracts from his journal[6] [299];

February 1st Bilwanya [north of Son]. No supplies of grain, of any kind, were to be had here; ...The latter part of the road had dwindled to a mere footpath, and I was informed that we could expect nothing but the wildest and most desolate regions for a considerable distance. ...

February 15th...Buy rice, or rather requisition it, at 25 seers to the rupee, 60 % dearer than we had paid at Shawpour[7]. ...

24th Sonehat[8]...met the Rajah of Corair. ...

March 11th [from Mahtin[9], north of Bilaspur]. I proceeded about 13 miles to the little village of Noaparrah, consisting of only 3 miserable huts. ... This day one of my camels died with symptoms of the hydrophobia; having for some days been so restless and unruly, that he was continually throwing off his load. I could not easily account for this circumstance, until I recollected that the night before I left Rajegaut near Benares, a dog had run into our camp, and bit the animal in the face, as also a *Tattoo*[10] in the leg, which had afterwards died in a very unaccountable manner. ...

13th. Ruttunpour[11]. [met friendly Maratha chief]; he expressed much surprize at our having travelled through such dreary wilds and mountainous paths; and told me that the *Mahratta* troops always experienced the greatest inconvenience, when sent into that country from the want of provisions, and always suffered much from the badness of the water. ...

I had now travelled 296 miles from Chunar to Ruttunpour, in 44 days. The local people advised against any attempt to visit *Omercuntuc*[12], for fear of the Goands. ...

April 4th. A journey of 7 days...terminated this day on the southern confines of Chotesgur[13]. It was here that I first met the Mahnuddee or Cuttack river, and crossed it to enter upon the thick woods of Conkair.

5th. This day a very serious misfortune befell me, in the loss of the only *Hircarrah* who had ever before been in these wild and unfrequented tracts. ... He had three days before, been indisposed with a complaint in his bowels, probably owing to the change of water, which had induced me to dispence with his attendance, in order that he might travel at his leisure, in company with another sick man; ...they were both missing. ... The *Mahrattah Hircarrah* replied by conjecturing, that they had been robbed and murdered on the road by the Goands.

At Kānker the Rāja dissuaded Blunt from trying to reach Vizianagram[14] by way of Bastar and Jeypore[15], and turned him westwards towards Chānda[16]; and to support a request for a trustworthy guide Blunt sent the Rāja

a quire of gilt writing paper, and some coloured China paper. In the evening my messenger returned with an account that the *Rajah* had been delighted with the little present...and had in very satisfactory manner complied with my request.

April 12th. Two Hindu mendicants, *gossains*, joined the party, having escaped from the Khōnds who had massacred the rest of their band.

19th. *Purla*. Proceeded through the eastern side of Chanda, skirting round the *Goand* hills and *jungles* which lay to the left of my route. *Bustar* is so wild that it is never frequented by travellers; and I was told of more instances of *Fakeers* having been murdered in attempting to penetrate through it. ...

20th. The hostilities which at this time existed between the *Nizam* and the *Mahratta* empire [116] suggested to me the necessity of proceeding with caution in passing the frontier

[1]DDn. 16 (60), 4–12–94. [2]63 L. [3]64 I. [4]64 J & G. [5]64 H/7. [6]*As R.* VII 1801. (57–191) & *As AR.* 1800. (128–200), cf. Wills (119–35). [7]On old maps, MRIO. 95 (53) etc., Shawpoor is chief town of Singrowla, in S. extremity of Mirzāpur; names still locally known, tho' dropped from modern maps. [8]64 I/11. [9]Mārtin, 64 J/6. [10]Pony. [11]Ratanpur, 64 J/4. [12]Amarkantak, 64 F/10 [000]. [13]Chattisgarh, tract covering 64 I, M, N. [14]65 N/8. [15]65 J/9. [16]56 M/5.

of their respective countries, for, having no pass ... to produce to the Nizam's officers, it was uncertain in what manner they might receive me.

Leaving the Wainganga River at Dewalmari[1], a few miles below its junction with the Wardha, Blunt proceeded south-eastwards towards the Indravāti River, and on April 30th was fired on by a party of Khōnds;

At this instant fortunately, I was joined by a naik and four sepoys of my escort, and immediately formed them, priming and loading in a little space of open ground on our right. As soon as the sepoys had loaded, I would fain have parleyed with the savages before firing, but all my endeavours towards it were ineffectual; and as they continued to rush with impetuosity towards us, with their matches lighted, and arrows fixed in their bows, they received the fire of my party at the distance of about twenty yards; when four or five of them instantly dropped. This gave them an immediate check, and they ran off, hallooing and shouting, into the woods. ... I directed a party of a *naick* and four *sepoys* to drive them from the hill; this they soon effected. ...

Came to the bank of the Inderowty river, where not being able to find a ford, we were necessitated to encamp on its bank. ...[2]

Finding the people of the country thus inhospitably inclined towards us, I conceived it would be hazardous to send a messenger to Bhopaulpattun[3]; for should he be detained or put to death, we might wait in vain for an answer, until the numbers by which we should be surrounded would effectually cut off our retreat. The Goands appeared to be in full expectation of our attempting to pass the river; which they would no doubt have resisted; so that the only way to extricate ourselves from the present embarrassing situation, was to retreat as fast as possible by the road we had come; ... the weather clearing up at daybreak, we moved off in perfect silence.

Arrived back at Dewalmari, Blunt found a friendly Khōnd chief, and after making him a present of his fowling piece, was given a letter to the Dewān in the Nizām's territory; never having expected to be forced so far to the south he had not been provided with any letters to the officials of the Nizām. He now followed down the Wainganga to Sironcha[4] at the junction with the Godāvari, which he crossed and coming into the Nizām's dominions, followed the right bank of the river towards the south-east.

May 5th. Marching at this season in the heat of the day oppressed us exceedingly; but the unsettled state of the country, and the probable risk of being attacked, rendered it unavoidable. Although the road was a beaten one, and tolerably clear of brushwood, yet the forest on each side, being excessively thick, might if we had moved in the dark have enabled an enemy to come upon us unawares; whereas by travelling in the day and taking our ground in a clear spot, we were always in a situation to defend ourselves with advantage.

The women and children who had accompanied the *sepoys*, and who, at the commencement of our journey, had been accustomed to ride, were now, from the reduced state of the cattle, compelled to walk. They appeared however to be fully impressed with the necessity of the case; and although they would have suffered less by travelling in the cool of the night, yet they must have created considerable confusion, in case of an attack at that time; exclusive of which considerations, the daylight was essentially necessary to my geographical pursuits. ...

May 15th. Intercepted by officials of the Pāloncha[5] Rāja, with 25 armed horsemen and about 300 infantry, who demanded a Pass from the Nizām.

May 16th. Marched 16 miles to Pāloncha. The Rajah's people told tales of the desperate state of the English in the Circārs[6] and said that he proposed to send Blunt's party as prisoners to Hyderābād; Blunt said he knew many of the Nizām's officials at Hyderābād[7] and would welcome such a step; "their astonishment was so great that they immediately departed to make a report thereof to the *Rajah*." During the night about 1,500 armed men surrounded the camp.

17th. This morning the *Vakeel* came to me with a request, that I would send my *Toorky* horse, and three sheep which I had brought with me from *Chunarghur*, for the Rajah's inspection. This I readily compiled with; and at the same time demanded an interview with the *Rajah*, and permission to depart. ... In about an hour the horse was returned, with a very polite message from the *Rajah*, expressing how much he had been gratified by the sight of so

[1] 56 M/15. [2] near Desli, 65 A/4. [3] Bhopālpatnam, 65 B/5. [4] 56 N/13. [5] 56 C/10. [6] A fairy tale. [7] Blunt had spent the summer of 1792 at Hyderābād [43, 116].

beautiful an animal; and requesting to know if anything would induce me to part with him; but as the evening had been appointed for the interview, I deferred returning an answer. ... In the meantime the *Rajah* had detained my sheep, which having tails, were considered here as great curiosities and had sent me three others in return, the produce of his country, on whom nature had not bestowed that curious appendage. ...

Later in the day came the interview with the Rāja;

He began by putting many pertinent questions to me concerning *Hyderabad*, the *Nizam*, his minister, and the principal officers of his empire; with a view to finding out if what I had asserted the previous evening was true. My answers convinced him that I was much better acquainted with the Nizam's court... than he was. ...

As I suspected that the beauty of my horse had been the principal cause of our being brought to *Paloonshah*, I now took the opportunity of presenting him to the *Rajah*. His satisfaction at this event was warmly expressed, and he immediately desired I would make myself perfectly easy; for I should be at liberty to depart on the ensuing day. ...

The whole of the ensuing day was spent in procuring a supply of grain, and guides to direct us across the country. ... Our departure was consequently delayed until the morning of the 19th, when...the *Vakeel*...advised me to lose no time in quitting the *Rajah's* territory. ... At my departure, every household servant belonging to the *Rajah*, came out in expectation of some gratuity. ...

They were yet to pass the last point of danger;

May 20th. At daybreak we moved forward, and as the post of Dommapett[1] was only seven miles distant, it behoved me to pass it with caution. I collected therefore my party into a compact body; and we soon came in sight of it. I found it consisted of a small mud fort from which about fifty armed men issued, as we approached, and attempted to stop us. I showed them the *Rajah's* pass, to which however they paid no regard, but being now within five *coss* of the Company's frontier, I was determined not to be plagued by them; and drawing up the *sepoys* opposite to their party, I told the man in command that I would not be detained. ... I ordered the followers to move on with the baggage, and soon after followed myself with the *sepoys*. Some parties stole into the *jungle* upon our flanks; but finding that we kept a constant watch over them, they did not attempt to fire upon us. ...

May 21st. We had marched 27 miles from our last encampment; and the heat, for the last two days, had harassed us a good deal; but being now arrived within the Company's territory, our troubles were nearly at an end. Our grain was exhausted, and the village being too small to afford us any, I moved about six miles to the village of Tarpilly. ... In two more easy marches we reached Yernagoodam[2], a place in Colonel Pearse's route from Madras to Calcutta, where my geographical labours ended. ...

May 24th...I proceeded to Rajamundry[3], and having recrossed the Godavery, encamped under the north side of the fort. Here I had the first grateful sight of an European countenance. ...

The due southing of this journey was little more than eight degrees, but the circuitous windings we were obliged to take had increased the whole distance to 1,125 British miles.

The hard service which the cattle had endured, had reduced them so low, that a fourth part were now too much exhausted to recover, and perished. Two of my *Hircarrahs* had been cut off by the *Goands*; which with four followers attached to the *sepoys* was the whole loss our party had sustained; ...Indeed the utter impossibility of any individual escaping, who might leave the party, had necessitated the utmost precaution and indefatigable exertion of the whole, for our mutual preservation. ...

In forwarding Blunt's maps to Government, the Surveyor General writes,

The work has been projected upon a large scale, and will be accompanied by his Field Book containing all the original measurements, and many particulars of useful information.

As his tract lay mostly through countries unexplored, and which were deemed inaccessible to European Travellers, his survey has afforded a new and extensive measured line, to rectify the positions of several places, which had been doubtfully inserted in the maps, and has brought to light many more till then unknown. ...

He was obliged to deviate from the track which had been proposed, as he found it impossible to penetrate through the wild and inhospitable regions bordering the Northern Circars. ... This deviation, however, ...enabled him to ascertain the existance of a high road from Nagpoor to Rajamundry, and partly to trace the course of the Boungunga River[4] which falls into the Godavery at Suroocha[5], ...the confluence being more than 100 miles higher up than it is given in any former map[6].

[1] Dammapeta, 65 G/3. [2] Ernagūdem, 65 H/5. [3] 65 G/16. [4] Wainganga R. [5] Sironcha, 56 N/13.
[6] DDn. 16 (113), 26-2-96.

Blunt's journey through this inhospitable country was not repeated by any European official for over sixty years, and his route remained the only source of geographical information of the western borders of the Central Provinces for an even longer period[1].

GANGES–HOOGHLY RIVER PASSAGE, 1777–96

Rennell's survey of 1764–5 had not brought to light any new route from Calcutta to the Ganges; during the dry season heavy boats still had to go all the way round through the Sundarbans before they could get a clear run up the Great River.

In 1777, possibly inspired by the success of Major Tolly[2] with his canal south of Calcutta which had been opened that year [65], John McGowan put forward a scheme

to keep open the channel from the Ganges into the Cossimbazar River, and to keep the river open to navigation down to its junction with the Hooghly at Nadia[3],

with the concession of being allowed to collect tolls. Permission was given with certain restrictions, but two years later the Chief of Cossimbāzār protested against the collection of tolls before any attempt had been made to improve navigation. On McGowan pointing out that he had spent nearly two years in making surveys and levels, Government allowed him the salary of a surveyor, and withdrew his permit to collect tolls. His contract was annulled shortly after.

It was possibly in 1783 that Wilford made a careful survey of the channels into the Cossimbāzār and Jalangi Rivers from the Ganges, with several lines of levels[4]. His fieldbook contains a reasoned discussion of the feasibility of opening a cut to allow navigation in the dry season. He concludes that this would not be successful as the difference of levels would vary considerably at different seasons;

The Baugrutty[5] with the other Branches of the Ganges labour under all the disadvantages common to all large Rivers, which is, that near their mouths they generally have but little descent. For the Land above their mouths for a considerable extent is but an incroachment upon the sea, occasioned by a vast quantity of Sand and Earth brought down by the Current, which being repelled by the Sea falls to the bottom, forms at first shoals and Banks, which raising continually, at length appear out of the Water, forming a solid ground which is soon covered with grass and trees.

Such is all the Country from the Rajemall Hills down to the Sea. The bottom of the Bay of Bengal reaching formerly up to these hills. ...

He then quotes ancient Hindu records about the rivers of Lower Bengal.

At the end of 1794 James Hoare was deputed to survey the Hurdum and Jamuna rivers[6] for a navigable connection to enter the Hooghly from the east below Nadia, and in considering his report the Governor General observed,

The communication between Calcutta and the Upper Provinces during 7 months of the year is only practicable by the Sunderbuns, a hardy and dangerous navigation. ... I do not think Lt. Hoare's survey a sufficient ground for undertaking the object in view, but merely as furnishing materials for a further investigation, which I recommend to be made by the Surveyor General...[7]

and the Council

thought it proper to direct the Surveyor General to ascertain the existence or practicability of a communication by water between the Houghly River and Ganges at all seasons of the year, either by the channel of the Hurdum and Howleah, or that of the Jubuna, Issamutty and Howleah, ... taking into consideration the length of the navigation, the expence of making it practicable, and the probability of its continuing so after having been once made[8].

In March 1795, therefore, Colebrooke surveyed the Jamuna and found it unsuitable, but reported more favourably on the Hurdum, or Churni, submitting a survey from its source at Sibnibas[9] to its confluence with the Hooghly; he described certain narrow parts connecting with the Ichāmati;

[1] Grant (xi). [2] William Tolly. Ben. Inf. (*DIB*) [65 n. 5]. [3] BPC. 8–12–77 (15). [4] Fdbk. undated, IO. Maps MS. 49. Wilford's levels were read to tenths of an inch; one of his lines was 7 miles long and was proved by a second line by different route. [5] Bhāgīrathi, or Cossimbāzār R. [6] 78 D & 79 A. [7] BPC. 23–1–95 (2). [8] B to CD. 5–2–95 (62). [9] 21 m. east of Krishnagar, 79 A/11.

I proceeded next to observe with the proper instruments the difference of level between the two rivers, commencing from the place where the Hurdum ceases to be navigable; I carried my levels in line as direct as possible to the Issamutty, erecting the station staves at equal intervals of one furlong...each. The distance thus measured was six miles one furlong and a half. ...[1]

He recommended a cut to be made for this distance, 20 feet wide, by 15 or 20 feet deep, at an estimated cost of Rs. 30,000 and made a further survey of the Ichāmati River during May, when the river was at its lowest. In submitting this survey to Government, together with his survey of the whole route from Calcutta, through Tolly's Nullah and the Sunderbans, he strongly recommended the cut between the Churni and the Ichāmati, and said that it would save 155 miles on the route through the Sundarbans[2].

The Directors referred Colebrooke's proposals to Rennell, who commented very unfavourably upon their prospects of success; and made a wise appreciation of the problems involved, with conclusions that would hardly be disputed to-day;

Nature seems to have adjusted matters very nicely, in respect to the capacity of River beds and their levels; so that any tampering with them in delicate cases (particularly where there is so great a periodical swelling [in volume] and velocity of current) may be productive of much mischief[3].

In calling for the Surveyor General's reply, the Directors ordered that the cut which he proposed "must not be commenced without our previous approbation[4]".

GANGES RIVER ABOVE COSSIMBĀZĀR

In 1796 the Surveyor General suggested that he should make a survey up the Ganges from the head of the Jalangi River to Bhāgalpur;

The object of this Survey should be not only to delineate and report on the present state of this part of the great river, but also to endeavour by observing the Direction and Rapidity of the current, and the nature of its Banks, Islands, and Shoals, to form some probable conjecture as to the changes which are likely to ensue[5].

This was approved, and Colebrooke spent from November 1796 to the following February on an excursion up the river. His fieldbooks are filled with interesting comments, some in particular describing the changes that had occurred in the river course at the Colgong rocks[6]. He submitted maps on the one-inch scale[7] and among other matters pointed out the danger of encroachments on the city of Murshidābād, and the possible protection that might be afforded by cutting a navigable channel into the Bhāgīrathi.

He also put in a long memoir, comparing the course of the Ganges in the various years that he had travelled along it with that described by Rennell many years earlier, with various suggestions for the maintenance of free navigation along the river channels. The following extract may be of interest,

The encroachments, however, are as often carried on gradually, and that partly in the dry season; at which time the natives have time to remove their effects, and change the sites of their dwellings, if too near the steep and crumbling banks. I have seen whole villages thus deserted, the inhabitants of which had rebuilt their huts on safer spots inland, or had removed entirely to some neighbouring village or town. The Topography, I might almost say the Geography, of a large portion of the country, will be liable to perpetual fluctuation from this cause; as the face of the country is not only altered by the rivers, but the villages are sometimes removed from one side to the other; some are completely destroyed, and new villages are continually rising up in other spots[8] [21, 229].

Colebrooke made a particular hobby of these river changes, and spent much time on his many journeys up and down the river in recording them in detail, and Thomas Wood writes to him from Dinapore[9] after a journey up the river during the rains of 1798 [57],

[1]DDn. 16 (72). 12–3–95 SG. to GG in C. [2]River surveys 1795–7. MRIO. 163 (2 to 17). [3]DDn. 114. Rennell to C of D.10–3–96. [4]CD to B. 27–7–96 (42). [5]BMC. 3–10–96 (28). [6]Colgong, 72O/4. [7]"*Map, River Ganges, Sankarpur to Harisankar, via Sarda*, exhibiting the state of its islands & sands in 1796–7", MRIO. 164 (1 & 16). [8]BMC. 13–3–98 (55). *On the course of the River Ganges through Bengal.*; *As R.* Vol. VII, 1801. [9]72 G/2.

Here I am at length arrived after a pretty favourable passage considering the season of the year. Though I most full intended to have at least attempted what you recommended, a sketch of the river from Colgong upwards, yet I am sorry to acquaint you, it was completely out of my power. For many, many, years past the Ganges has not been known to overflow its banks so much as it has done this season, and it was but seldom, even with Rennell's map of the river, that I could make out where I was. I had not the smallest idea of what the Ganges is during the rains, until now that I have seen it, and though I have repeatedly gone up and come down at other seasons, believe me, I could not have known it for the same river[1].

Colebrooke's later journeys up the river as far as Cawnpore will be described in another volume.

SPECIAL SURVEYS IN CALCUTTA, 1795–6

In 1795 the Surveyor General was called on to advise the Military Board about a scheme for draining the land "near the General Hospital and the back of Chowringhee", by means of a canal draining into Tolly's Nullah, and to make a survey with levels for the purpose; he writes,

Upon the whole, the proposed scheme appears to be practicable, and highly eligible, as a quantity of putrid and stagnant waters which lodge in the drains and ditches about Chowringhy all the year round, might thereby be drained off, and the place would of course become more healthy[2].

and later,

As the business of my office at the present juncture occupies almost the whole of my time, I am apprehensive ... that it will not be in my power personally to pay that attention which would be requisite to compleat it as soon as may be expected, but ... I have directed Ensign Blunt, one of my assistants, to begin the survey under my superintendence[3].

Blunt completed the survey at the end of 1796, on the scale of 200 feet to an inch, "with a table of levels carried out to govern the excavation of the drain"[4].

The same year Government reviewed the lease which had been granted to Major Tolly and his widow for collecting tolls on the traffic passing through Tolly's Nullah[5];

The Governor General in Council observes that previously to coming to any final determination with respect to the proposed surrender of the grant of Tolley's Nullah, he thinks it necessary to ascertain now, fully, the present state of the Nullah, and the probable expence of making the necessary excavations for the purpose of facilitating the navigation of it.

Agreed ... that orders be issued ... to the Surveyor General ... to proceed immediately to survey the Nullah, and to report the present state of it, ... and the annual expence of making the necessary excavations in future for ... rendering the Nullah at all times navigable[6].

In June 1796 the Surveyor General submitted his report together with a survey made with the assistance of Blunt[7], who was then directed to see that the canal was cleaned out and excavated to the necessary depth.

CHITTAGONG COAST, 1799–1800

At the end of 1799 the Marine Board asked for a survey of the Chittagong coast, and Government ruled that "the service properly appertains to the Surveyor General's Department". Upjohn [54], who had now become an assistant in the office, was appointed to the survey with Mr. Jeremiah McCarthy and the vessel *Harriet* at his disposal, and with the following instructions from the Surveyor General;

The primary object being to survey the Chittagong River as high as it is usually navigated, with its entrance, and such a portion of the coast as vessels are liable to fall in

[1]DDn. 15 (61), Sept 1798. [2]DDn. 16 (107), Jan. 1796. [3]DDn. 16 (145), 1–10–96. [4]Map, BM. Addl. MSS. 13901 (B) printed copy, IRD. Lib. [5]Tolly's Nullah was made by Major Tolly at his own expence between 1775 and 1777. Being granted a 12 years lease for collection of the tolls, he died on his voyage home in 1784. and the lease was extended for a further period of 15 years to his widow; the Nullah was taken over by Government in 1804. *Ben. Sel.; Circular & Eastern Canals.* [6]BMC. 16–5–96. [7]Report. DDn. 16 (125), 30–6–96; Survey, MRIO. III (436).

with previous to making the port, you will of course begin with these several parts of the survey in the order in which they are here stated, viz. The Chittagong River to Islamabad, or as high as it is navigated, with its soundings, sand-banks, entrance and bar. This part of the survey, in order to be rendered more accurate and complete, should be performed partly with a theodolite and chain, or perambulator, and the latitudes of entrance, as well as of the highest spot up the river to which your survey will extend, should be accurately determined by observation of the sun and stars taken on shore.

The next object of your attention will be the coast. ... If this is begun...about 20 miles north of the entrance of the river, and continued down to Red Crab Island south of Mascal, the end as far as relates to the navigation of the coast of Chittagong will be answered. You will of course include in this part of the survey, the east and south sides of the island of Sundeepa[1], with the islands of Kuttubdia and Mascall, and be particularly careful to include all the shoals, rocks, and soundings, so as to construct such a chart as will be of real use and benefit to navigation. The variation of the magnetic needle and the latitudes of a few points within this track should be observed, and with a view to greater accuracy your operations may occasionally be conducted on shore. ...

P.S. I need hardly mention that in every part of the survey the soundings and track of the vessel should be laid down; and the set of the currents and the time of high-water noticed[2].

A few extracts are here given from Upjohn's journal[3], which extends from January 3rd to April 16th 1800;

15th February. This day, the boat having been stove on shore and rendered unserviceable by the violence of the surf, at 11 a.m. weighed for Chittagong to procure others, ...

Monday, 17th. Busily employed using every exertion to procure boats; for which purpose waited on Mr. P. the acting Collector, who could give me no assistance.

Tuesday, 18th. Purchased a large Dingey, and employed carpenters etc. to make the necessary alterations.

N.B. This day very ill in bed.

Wednesday, the 19th February. At ½ past 12, the boat being finished, and having hired another, weighed and proceeded down the river. ...

Wednesday, 26th...N.B. Returned on board very ill this day.

Monday, 31st of March. At daylight weighed and dropped down nearly opposite Captain Cox's bungalow[4]. Went on shore to the northward, in order to avoid as much of the surf as possible; in doing which the boat was swamped.

On my return to the ship, Captain Collins expressed his opinion that the *Harriet* would not be capable of proceeding further to the southward, in consequence of there being a heavy swell, the breakers near the ship having much increased, and his apprehension of approaching bad weather; that therefore I could not expect to receive any assistance from the *Harriet*, if I persisted in continuing my operations further south.

Upjohn was now continually on the sick list and died on 21st June 1800, shortly after he "had returned to the Presidency and handed in his charts, executed in a masterly manner[5]".

Upon Upjohn's death the Surveyor General asked for the regular appointment of an assistant,

who should be qualified to Survey by Sea as well as by Land, and who should be ready to perform any service of that nature which might be required by the Marine Board.

but Government did not approve;

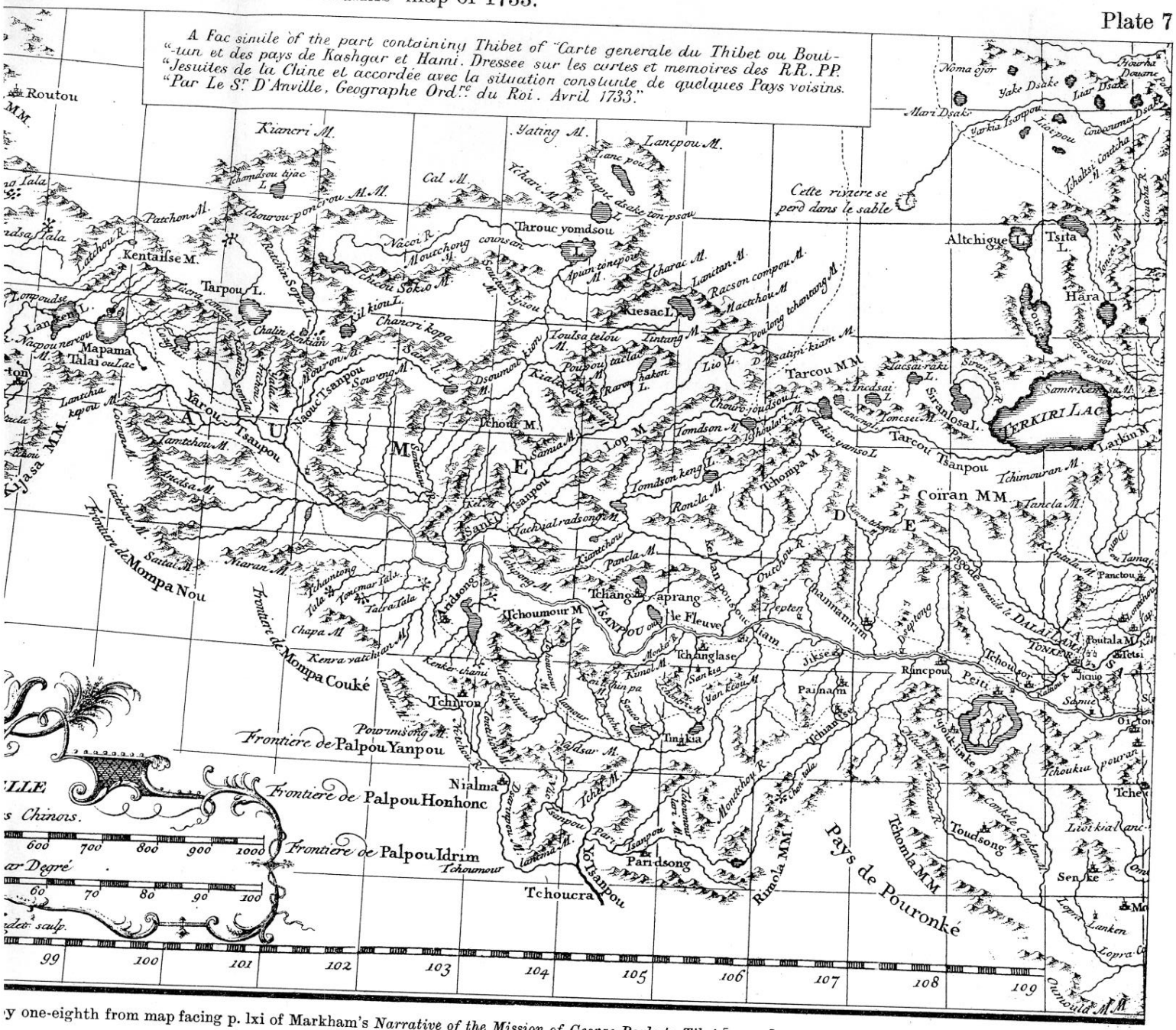
If the Marine Board deem such an appointment necessary, or if they are desirous of having any particular Survey of that nature performed, the Governor General in Council will readily take into consideration such Propositions...as shall be submitted to him by that Board[6].

There was no Marine Survey department established in Bengal until 1809, and until that time the Surveyor General was responsible for various coastal surveys, and for the collection & custody of marine charts.

[1]Sandwīp I., 79 N/7. [2]DDn. 14 (139), 10–11–99. [3]DDn. 39, M. 255. [4]Cox's Bazar, 79 O/14.
[5]Charts, MRIO. 171 (69, 70); DDn. 67, from SG. to Marine Board. 23–6–1800. [6]BMC. 16–10–1800 (34).

LADĀKH to LHĀSA

from the LAMAS' map of 1733.



y one-eighth from map facing p. lxi of Markham's *Narrative of the Mission of George Bogle to Tibet* [70–1].

Published at S.I.O. Dehra Dūn.

de's *Description de l'Empire de Chine* amas' survey as adjusted by Father above, which sections are three times llowing note by the translator;

rrected and improved by the Missionaries al observations, ... the Missionaries have as Adjusted the Situation of the Country China, whose Latitudes were observ'd, Lasa...is, according to P. P. Dorville it the Map differs from their observations h & West of Mount Kentais, where the d down from Report of the Natives.

· pp. 384, 386) from the account sent many versions of the story [70];

Regis because

rvation, and...the Distances were not ation.

mathematical Academy. ... They were ntry from *Si-ning*...to *Lasa*, the Grand

Faults. However, by the Help of the Measures used in this Map, by comparing it with some Itineraries, ... they found themselves not unprovided with Materials for drawing a Map of all *Tibet*, more correct than any hitherto published.

The reason for the Lamas having to break off their survey was the invasion of Tibet by Tartars from the North;

All the *Lamas* that could be found were transported into *Tartary*. The two *Lamas* employed in making the Map of *Tibet*, who were of the Yellow-Hat Party, narrowly escaped the Fate of their Brethren. But as they were hurried by this Accident, they were obliged to content themselves, in many Circumstances relating to the Countries round the Source of the *Ganges*, with such information as the *Lamas* in the neighbouring Pagoda could afford them, and with what they could learn from the Historical Account found at the Grand *Lama's* at *Lasa*.

The River *Ganges* issues from the W. of the Mountain *Kentais*... . If therefore the Latitude of that Mountain had been taken by Observation, the course of the *Ganges* might have been more easily determined. But our *Lama* Geographers followed and measured the course of the Tsan pu, which flows from the E. of the same Mountain, and their Measures alone cannot be supposed sufficient for accurately fixing the Latitude of *Kentais*.

The Lamas have been held to scorn for foisting upon the world their crazy course for the upper Ganges; but it was an honest mistake, the best they could make of the information collected. They had not [illegible]

CHAPTER V

BEYOND THE BARRIERS

HIMĀLAYA MOUNTAINS; Jesuit Missionaries — Lama Survey of Tibet, 1712–7 — Sources of the Ganges & Gogra — Bogle & Turner, 1774–84 — Nepāl — The Snowy Range — ASSAM; The Brahmaputra — Welsh's Expedition, 1792–4 — The Eastern Frontier — BURMA.

IN describing the boundaries of "Indostan" Orme writes,

> Mount Caucasus forms its barrier to the north, separating it from the various nations of Tartars, from the great and little Thibet. From mount Caucasus to Chittigan, marshes and rivers divide it from the kingdoms of Tepra[1], Assam, and Aracan[2].

In this chapter we tell of the early efforts to explore these barriers and the countries that lay beyond.

Ptolemy [207] shows the Caucasus, Mons Imaus, and Emodi Montes, stretching as a continuous barrier along parallel 38°, and the ideas of geographers of the 16th and 17th centuries may be seen in plates 11 and 16.

Marshall writes in 1670 [17 n. 6],

> The Morung, Neopoll and Botton hills[3] are in Tartary and the last of which are called Nettee Cuttee, which are Caucasus hills. All are out of the great Mogull's Dominions[4].

The name Caucasus was given to the whole range because it was considered

> properly a continuation of the great Caucasus, which stretches from the ancient Media and the shores of the Caspian sea, round the north-east frontiers of Persia, to Candahar and Cassimire, and thence, continuing its course more easterly, forms the great northern barrier to the various provinces of the Mogol Empire, and ends, as we have reason to believe, in Assam or China[5].

Wilford, writing at the end of the 18th century, applies the name to the present Hindu Kush[6], recording that this

> country, which very much resembles the valleys of Cashmir, and Nepal, is mentioned in the Ayeen Akbery [133 n. 3]; ...It must not however be confounded with the famous country of *Cash-ghar*[7] or *Cashcar* to the eastward of *Samarcand*... The original country of *C'hasas* seems to have been the present country Cash-gar, to the north-east of Cabul, ...hence Ptolemy with great propriety, asserts, that the mountains to the north-east of Cabul, are the real Caucasus. ... The capital city of *Cashcar* is called *Chatraul*[8], ...and is the place of residence of a petty Mahometan prince[9].

The mountains presented a formidable barrier to all knowledge, and it was not until the 17th century that the first Jesuit missionaries made their adventurous journeys, endeavouring to establish mission posts in these inhospitable regions, and sending back accounts of their travels, and descriptions of the mountains, country, and people. They did not make their journeys for the sake of exploration or geography, but to carry the Gospel into the far lands[10].

The French geographers of the Sanson family [209] were the first to map the information sent home by the missionaries "but", writes Markham,

> Guillaume Delisle, was the first to publish a map of Tibet. ... His map of Central Asia of 1706 [209] contains many details, published for the first time, which must have been obtained from the Jesuit missionaries. ... Delisle obtained much information, but he had no precise knowledge respecting relative positions, so that his map is very confused. For instance, Tibet and Utsang[11] are inserted at a distance from each other, as if they were different places[12].

[1]Tippera or Tripura; 79 I.M. [2]Orme, I (2). [3]Murang, Nepāl, Bhutān. [4]John Marshall (163). [5]Stewart (188). [6]38 I.M; 42 D.H. [7]39° 28′ N; 76° E. [8]Chitrāl, 38 M/13. [9]Paper entitled *On Mount Caucasus. As R.* VI, 1792 (455–7). [10]The earlier judgements on their reports did them scant justice *v.* Stewart (188). [11]Central, or Great, Tibet. [12]Clements Markham (cxxviii–ix).

The following is a brief summary of the travels of these missionaries, and of the principal contributions they made to geography through their journals, letters and observations[1].

We have already told of Father Monserrate at the court of Akbar [11]. In the map of his travels [pl. 10], certainly not known to D'Anville or Rennell, he gives a very fair representation of the lie of the mountains, and the courses of the upper Indus and Punjab rivers, and shows Lake Mānasarowar[2].

He first saw the mountains from south of Ambāla;

Mount Imaus, which local people call Cumaun, burst into view, covered with snow, and throwing off a chilly wind. ... The inhabitants say that the sources of the Jumna are in this region, where the mountains slope westward towards the plains of Delhi. The Ganges rises on a slope that faces east, with a difference in longitude of 280 miles, and on the same latitude, 30 degrees and a third[3];

information that would account for the curious position assigned to the Ganges on his map.

In 1602 Benedict de Goes[4], who had been member of the third Jesuit mission to Akbar in 1595, was sent from Goa on a mission to "Cathay", which was then thought to be an unknown country in the heart of Asia.

Leaving Lahore in 1603 he travelled in company with trading caravans, by Peshāwar, Jelalābād and Kābul to Yārkand; from here he visited Khotan[5], then from Yārkand through Turfān[6] to Suchow[7], where he died in 1607, having proved conclusively that Cathay was but another name for China. His property was looted after his death by the local people, and his diary torn open and mutilated[8].

In 1624 Antonio de Andrade[9] travelled from Agra through Srīnagar in Garhwāl, over the Māna Pass, to Tsaparang[10] on the Sutlej, and back to Agra. He returned to Tsaparang the following year, established a mission, built a church, and stayed there till 1629, when the Tibetan chief was overthrown by the Ladākhis, and he had to withdraw[11].

He was followed by Francis de Azevedo[12] who went to Tsaparang in 1631, but finding it impossible to re-open the mission, travelled on to Leh, and then by way of Lāhul and Kulu returned to Agra early in 1632[13].

We now come to the travels of Ippolito Desideri[14], and begin with his start from Delhi in 1714;

On the 23rd of September we together[15] began our journey towards Tibet. We went by way of Lahore, which we reached on the 10th of October. ... We left Lahore on the 19th of October, and in the course of a few days reached the foot of the Caucasus.

The Caucasus is a long range, consisting of remarkably steep and lofty mountains. After crossing one mountain you encounter a second still higher; this is in turn succeeded by a third, higher than either of the two former ones; and the farther you go the higher you climb, till you reach the highest of all, namely Per-Pangial[16]. ...

The summits of the highest mountains are always covered with snow and ice. We took twelve days to traverse these mountains on foot, crossing at times, with incredible difficulty, impetuous torrents, which formed by the melting of the snow, dash down with extreme violence amid rocks and boulders. ...

On the 10th of [November] we arrived at Kashmir. The enormous quantity of snow which falls during winter, and which absolutely closes up the passes, obliged us to remain there for six months. ...

We had left Kashmir on the 17th of May 1715, and the 30th ... we crossed the mountain and entered Tibet. Much snow had fallen on the path, which winds between mountains as far as Leh, or Ladak, the fortress where the King resides, which are the very picture of desolation, horror, and death itself. They are piled one atop of another, and so close as scarcely to leave room for the torrents which course impetuously from their heights, and dash with such

[1]For fuller details see Wessels, De Filippi, Maclagan; earlier accounts, Murray & Clements Markham, not always accurate. [2]Geography discussed by Wilford; *As R.* VIII, 1805 (322–3). [3]from the Latin of *Commentarius* (591). [4]Lay Brother; arrd. Goa 1589; d. 11–4–1607. [5]37° 10′ N; 80° E. [6]42° 57′ N; 89° 5′ E. [7]39° 45′ N; 98° 38′ E. [8]Wessels (10–39). [9]b. 1580, at Oleiros, Portugal; 1600, to Goa; d. 19–3–1634, at Goa. [10]Chabrang Dzong 53 M/11; *v.* Dshaprong, pl. 7 & Chaparang, pl. 6. [11]Maclagan (335–68); Wessels (43–91). [12]b. 1578, at Lisbon; 1597, SJ. at Goa; 1627, Mogor Mission, at Agra; d. 12–8–1660, at Goa. [13]Wessels (94–119). [14]b. 20–12–1684, at Pistola Italy; ordained, 28–8–1712; left Rome for India, 27–9–12 returned, 4–11–27; d. 14–4–1733, at Rome. [15]Father Freyre accompanied him. [16]Pīr Panjāl, 43 K; highest point 14,154 ft.

deafening noise against the rocks as to appal the stoutest traveller. ... [reached Ladāk June 25th]...We left Ladak on the 17th of August 1715[1]. ...

Finally, two years and four months after I left Goa, and one year and a half since our departure from Delly, and ten whole months since leaving Kascimir, we arrived by the grace of God, on the 18th day of March 1716, at the city of Lhasa[2].

The full MS. narrative of Desideri's journey was not discovered until 1875, and was published in Italian 29 years later. An English translation was published in 1932[3], and once more we find that most valuable contributions to geography had been lost to the 18th century. Among those pointed out by De Filippi are the following;

We find the first hint of the sacred mountain Kailas, of Lake Manasarowar, of the great valley of the Tsang-po, ...news of Baltistan, and news also of Ladak. ...

Desideri...states unequivocally that Southern Tibet is traversed through its whole extension from east to west by a single great river, which he identifies in a manner which leaves no room for doubt with the upper flow of the Brahmaputra—a remarkable affirmation at that date, when one thinks of the long controversy on that subject that was only settled at the beginning of the present century[4] [78–80].

Desideri described the extent and boundaries of Tibet, and placed the latitude of Lhāsa at 29° 6′, as compared with its true of 29° 39′ 16″; he stayed in or near Lhāsa until "in 1721 he received instructions that the mission field of Tibet was to be surrendered to the Capuchins, and he left on April 25th 1721", returning to India by way of Nepāl[5].

Turning now to the east, we find that two of these devoted missionaries had entered Tibet from Assam and Bhutān nearly 90 years before Desideri's great journey through Kashmir.

On August 2nd 1626 Stephen Cacella[6] and John Cabral[6] left Hooghly, and travelling through Dacca reached Azo[7] [pl. 13], the capital of Lower Assam, on September 26th and Biar [Cooch Behār] on October 21st[8].

Leaving Biar on February 2nd 1627 they reached Paro in Bhutān on March 25th. They were here received in a most friendly manner, and it was with some difficulty that they were able to leave and continue their way into Tibet. Cabral reached Shigatse[9] in January the following year, and after Cacella's arrival returned by himself through Nepāl to Hooghly. Cacella remained behind and after a visit to Bhutān died at Shigatse in 1630. Cabral made another journey to Shigatse and back to Hooghly during 1631–2[10]. It will be noted that Cacella and Cabral were making their visits to Shigatse at about the same time that Andrade and Azevedo were travelling in the Sutlej valley and Ladāk.

And now we come to our last two figures in this romantic epoch, Johann Grueber[11] and Albert d'Orville[12], both members of the band of Jesuit missionaries working in China, of which we shall have more to say shortly [70]. Receiving a summons to Rome, and being unable to travel by sea because of war with Holland, Grueber was ordered to find a route overland.

With d'Orville as companion, he set out from Pekin on April 13th 1661, and travelling through Siningfu[13] they reached Lhāsa on October 8th, the first Europeans, with one doubtful exception, to visit that holy city. Crossing the Kampa La they reached Kātmāndu in January, and passing through Motīhāri and Patna reached Agra in March 1662, where d'Orville died the following month. The only account of this journey that was ever published was written up from their letters, and gave the values of the latitudes observed [149][14].

After d'Orville's death Grueber continued his overland journey to Italy, travelling through Makrān, Persia, and Asia Minor. His full journal, which would have been of thrilling interest to geographers, has never been found[15].

[1]Translation of letter from Lhāsa, 10–4–16; Clements Markham (302). [2]De Filippi (90). [3]ib. (158 *et seq*). [4]ib. (36, 43). [5]ib. (108). [6]b. 1585, at Aviz, Portugal SJ. 1614; to India 1614; d. 6–3–30, at Shigatse. [7]Hajo, 78 N/7. [8]b. 1599, at Celorico, Portugal; SJ. 1615; to India 1614. [9]77 C/15. [10]Wessels (162). [11]b. 1623 at Linz on Danube; SJ. 1641 d. 1680. [12]b. August 1621, at Brussels; SJ. 1646; with Grueber from Europe 1656 to Goa; 1658 to Macao; 1660 to Pekin; d. 8–4–62, at Agra. [13]36° 36′ N; 101° 45′ E. [14]Clements Markham (295–302); Wessels (166–203); cf. RE. Journal, Sept. 1923. (355n.). [15]Clements Markham (lvii).

Further knowledge of Tibet was acquired from the Capuchin missionaries, who reached Lhāsa in 1719 by way of Nepāl, and whose letters were written up by Horace della Penna[1]. He makes reference to the country of *Kamul*, which appears on Gastaldi's map of 1561 [pl. 16], and this was first described by Marco Polo, from whose travels Gastaldi takes most of his information for Central Asia. Marco Polo's contributions to geography were indeed remarkable, but were narrated from memory with the assistance of a few notes, in 1298–9, after his return to Europe[2].

LAMA SURVEY OF TIBET, 1712–17

The first map of Tibet and the Himālaya range to be based on systematic exploration was D'Anville's map of 1733, compiled from the maps and surveys sent home by the Jesuit missionaries at Pekin with their great survey of China.

We have already mentioned the astronomical observatory at Pekin where Grueber and d'Orville worked in 1660. In 1698 the mission was joined by Father Jean-Baptiste Regis[3], who worked on the survey and mapping of China for the next twenty years.

Whilst he took the general geography from Chinese books which gave general descriptions, distances between important towns, and a few rough sketches, he and his fellow missionaries made systematic astronomical observations over a wide area. It is said that in 1701 alone they observed

at Pekin and 1700 neighbouring towns and villages. In 1708 they measured the Great Wall & found it to be 20 degrees longitude in extent. The western end brought them to Si-ning, on the frontier of Thibet, near the great lake Kukunor[4]. They returned to Peking in 1709. In the same year... and in 1710... they made a map of Liao-tung and Manchuria.

Regis continued his work for the rest of China, either going himself, or sending his Jesuit companions to Mongolia, Formosa; ... the new map was completed on January 1st 1717[5].

The survey was extended to Tibet by other agency:

The Emperor Kang-hi, having been satisfied of the accuracy of the European method of surveying, from the examination of a map which the Jesuit missionaries had executed of the country round Peking, resolved to have a survey made of the whole Empire on the same principles[6]. ...

About 1705 a dispute arose amongst the Lamas of Tibet. ... The emperor... despatched a Mandarin to arrange matters. ... The latter took with him two of his subordinates who were ordered to draw maps of the country of the Great Lama. After their return to China in 1711, the maps... were handed to the Jesuit Regis, with the direction to draw them to the scale of the existing maps of the other Chinese provinces.

As the maps indicated neither longitudes nor latitudes, Regis declared his inability to comply with the Emperor's request; whereupon Canghi selected two Lamas who had been trained... at the academy founded by his third son, and despatched them to Tibet with orders to draw accurate maps of that country as far west as the Ganges. Their expedition was so far successful that they reached Lanka-Dhe (the Rakas Lake)[7]. They learned from the Lamas of a local monastery, that the Ganges had its origin in that Lake. However, before they were able to take latitudes of the Lanka-Dhe region... the two Lamas had to flee from the country.

On their return to Pekin in 1717, their maps were again submitted for comment to the missionaries. These distrusted the work, but had not the courage to reject it altogether for fear of giving offence. ... The result of this half-hearted attempt was, that the Lamas' map, showing the Ganges issuing from Lanka-Dhe, was accepted as correct[8]. ...

they gave a fair idea of the upper gorges of the Sutlej and Indus, but were completely misled when they swept these round to become the Ganges [pl. 7].

From the maps sent home to Paris, D'Anville produced his atlas of 42 maps, as a companion volume to Father du Halde's[9] four-volume *Description de l'Empire de la Chine*....

[1] b. 1680, at Macerata, Italy; d. 20–7–47, at Pata, Nepāl; Clements Markham (lix-lx & 309–340).
[2] For Marco Polo's travels *v.* Murray (151—82), & *Ency. Brit.* [3] b. 11–6–1663, in Provence, France; d. 24–11–1738, in Pekin. [4] 37° N; 100° E. [5] Brucker. [6] Clements Markham (lxi). [7] West of Lake Mānasarowar, 62 F/2. [8] Summary of Du Halde's account; Noti (409). [9] Jean-Baptiste du Halde, SJ. b. 1674, in Paris; for some years compiler of *Lettres édifiantes et curieuses*; d. 1743.

A portion of the *Carte générale du Tibet, ou Bout-tan...* , dated April 1733, appears on plate 7. Other "cartes particulières du Tibet" appear in the atlas which was published in Paris[1], with the following

Avertissement. Toutes les Cartes ayant été mises au même point et sous une projection générale, les originaux surent présentez à S.M.T.C.[2] par le P. du Halde tels qu'il les avoit reçus des missionaires et se conservent dans la Bibliothèque du Roi.

Avant que d'être mises entre les mains des graveurs, elles ont passés par celles de M. D'Anville.

Rennell had no other authority for these regions, but records his distrust;

We have the history of the Lamas' map in Du Halde, which is not altogether favourable to its character, especially in the parts towards the source of the Sanpoo & Ganges. A close examination of its particulars turns out still more unfavourable to it. For instance the place where the Ganges enters the plains of Hindoostan, is placed under the 28th degree of latitude, though it is known by our late observations to be in about 30[3] [pl. 6].

He was blamed by his contemporaries for not having taken a stronger line and rejected the Lamas' map altogether, but his only alternative was to leave the area blank as he did in his final map of 1792 [pl. 8].

SOURCES OF THE GANGES & GOGRA

From the earliest times there had been speculation about the source of the Ganges, and it was natural that legends of mystery should be attached to the source of a river whose waters were endowed with such special sanctity. D'Anville writes that,

According to Ptolemy, the ancients knew as little of it as of the origin of the Nile; ...We mistook for the head of the Ganges, a place inclosed between the mountains which separate India from Tibet, through which this river runs into India. According to...Terry, the Indians are of opinion that the waters...rise in the province of Siba. ... The Persian historian of Timur[4], conducting that conqueror as far as the entrance of the Strait of Kupela[5], ...says that 15 miles above this strait, there is a stone cut in the shape of a cow, from whence the Ganges springs[6].

The curiosity of the Emperor Akbar was intrigued by the legend, and towards the end of the 16th century he sent a special mission of exploration, which penetrated to the neighbourhood of Gangotri;

On s'avança toujours du côté du Nord, & plus on approchoit de la source, plus le lit du fleuve s'étrécissoit. On traversa des forets inhabitées, où il fallut se faire des chemins nouveaux. Enfin on arriva à une haute montagne, qui sembloit taillée par l'art en forme d'une tête de vache. De la coule une grande abondance d'eaux, qui semblerent aux Députés être la premiere origine du Gange. On ne pénétra pas plus avant. On revint après avoir couru de grands dangers, faire à l'Empereur le rapport du voyage. La Relation des Députés fit inserée dans la Chronique[7].

It was some years after this journey that Terry[8] wrote in 1655 describing

Hardware, where the famous river Ganges, passing through or amongst large rocks, makes presently after a pretty full current; but both this and that other great river Indus have their rise & original out of the mountain Caucasus, from whence they both first issue.

That principal rock, through which this river Ganges there makes a current, is indeed, or (if not), according to the fancy of the superstitious Indians, like a Cow's Head, which of all sensible creatures they love best[9].

Father Desideri who passed close under Mount Kailas[10] on his march from Ladāk to Lhāsa in 1715–16 [67–9] noted that this seemed to be the source of the Indus and the water parting between east and west;

It seems that the above mentioned mountain Ngnari Giogar must be regarded as the fountain head not only of the river Ganges, but also of the Indus. ... Being the highest point of this region, the water drains off on two sides. To the west it flows through Second Tibet to Lesser Tibet until it reaches the Mountains of Cascimir, and finally, near Lesser Guzerat[11]

[1] *Nouvelle Atlas de la Chine.... et du Thibet*...Paris, 1735; 1737. IO. Maps, II, AC. 35. English edn. London 1738. 2 vol. [2] Sa Majesté trés chrétienne. [3] *Memoir*, 1793 (300). [4] Scheresseddin, 15th Century; Bernoulli, II (281). [5] The george above Rikikesh, 15 miles above Hardwār. [6] Herbert (21). [7] Quoted from Manouchi, Bernoulli, II (282–3). [8] Chaplain to Sir Thomas Roe "lord ambassador to the Great Mogul"; Terry & William Foster. [9] Terry (74). [10] Height 22,028 ft., 62 E/8. [11] Gujrāt, Punjab, 43 L/2; distinguished from Gujarāt, Bombay, 46 B; actually, the Indus flows about 150 m. west of Gujrāt.

forms the navigable river Indus. On the eastern side, another large body of water flows into lake Retoa and eventually forms the river Ganges[1].

But Desideri's report did not reach D'Anville or Rennell who followed the Lamas' map, as D'Anville writes,

We have learned that at the foot of the Kentaisse[2] mountains, the Ganges, formed by several springs, crosses successively two great lakes, and takes its course to the Westward, where meeting with a chain of mountains that obliges to turn to the Southward, and then winds itself between the East and South, till wholly directed towards the latter it enters India, which it cannot do but by opening itself a passage between the mountains. ... This discovery has added to the Ganges about 200 leagues[3].

Wilford explains that,

It is one of the Southern peaks of Mount *Cantaiseh*, which, rising behind the subordinate peak of Kyemlung, is considered by pilgrims as the source of the *Ganges*. There ended the survey of the *Lama* mathematicians, and the countries to the South and South West were added afterwards, from the report of natives[4].

D'Anville made slight modifications which Rennell accepted and wrote,

In placing the heads of the Ganges and Sanpoo rivers, I have followed M. D'Anville's correction of the Lamas' map in Du Halde, ...and have continued the course of the Ganges to the place where it enters Hindoostan, from the same map. I have said before, that I consider this part of the Lamas' map as a very vague performance; but the want of better materials obliges me to make use of it. I suspect that the Ganges does not take quite so wide a circuit to the northwest, as is there described[5] [71].

Duperron on the other hand was emphatic in his scorn and justly remarks,

Sans peut-être en avoir de meilleurs, M. Rennell ne peut plus employer des Materiaux dont on connoit maintenant le defectueux[6] ...

whilst Hodgson, in 1821, overlooking perhaps the doubts that Rennell expressed, wrote that

in some few instances he failed, particularly in his conjectures respecting the [upper?] part of the course and the source of the Ganges[7].

In 1786 the publication by Bernoulli of the maps and writings of Father Tieffenthaler brought fresh information from a new and apparently trustworthy source[8]. Anquetil-Duperron had compiled Tieffenthaler's maps into a general map [12] which he published with notes of his own in 1784; learning thus of Tieffenthaler's work, Bernoulli[9], then a professor in Berlin, obtained his *Descriptio Indiæ* from Denmark, and published a translation, to which he added, in two further volumes, an expanded edition of Duperron's treatise, and a translation of Rennell's *Memoir*[10] [214].

He included Duperron's general map with large-scale insets shewing the sources of the Ganges and Gogra as sketched by Tieffenthaler from native information. These place the famous Cow's Mouth at Gangotri about 3 degrees west and 3¼ degrees north from Hardwār (the correct distance being about 40′ E. and 65′ N.), though Tieffenthaler observes that, "La vraie source du Gange est inconnue, & elle ne sera jamais découverte, parce qu'au delà de la bouche de la Vache les chemins sont impractiquables[11]," a suggestion ridiculed by Duperron.

In a sketch of the lakes "Mansaroar" and "Lanka Dhé[12]", three rivers are shewn rising from the former; against that flowing to the east Tieffenthaler notes,

On dit que le Brahmapoutren qui va à Ascham et à Rangamati, sort de ce Lac [80, 209].

and against that flowing to the north-west

On dit que le Satloudj qui va à Belaspour et à Lodiane, sort de ce Lac; mais cette assertion ne mérite aucune croyance, car il est plus vraisemblable qu'il se jette dans l'Allaknanda qui arrose Badrinath et Sirinagar, ou dans une autre Riviere.

The Gogra is shewn flowing from the "Lanka Dhé", with the notes,

Le Sardjou sort de ce Lac. On appelle ce fleuve Sardjou tandis que c'est réellement le Gogra, à cause de Sardjou qui s'y jette à Pasca.

[1] De Filippi (83-4). [2] Kailas. [3] Herbert (21). [4] *As R.* VIII, 1805 (322–3). [5] *Memoir*, 1783 (99). [6] Bernoulli, II (491). [7] DDn. 196 (90); SG. to Govt. 18–9–1821. [8] Maclagan notes that Tieffenthaler never quoted his authorities. [9] Jean Bernoulli, b. 4–11–44, at Basle; a great astronomer; d. 1807, at Berlin. [10] 1785 Edn. [11] Bernoulli, II (279). [12] Mānasarowar or Tso Mapham; Lagang or Rakas, 62 F/NW.

The INDUS to the GANGES
Rennell, 1792.


Part of
GREAT TH
Himna-leh
Mountains
(Imaus)
THIBET
CASHMEREE
KISHTEWAR
BUNDURAL
BEHDUROO
JUMMOO
CHUMBA
KANGRA
BISSOOLY
PUCHHOLI
BENEER
SINDE
SAGUR
DOAB
PANJAB
HINDOOSTAN
DESERT
Desert of Gdlli
Desert of Sohaun
Lake Jungul
Country of Bhat
Nilab or Sinde R.
Jhylum or Tehauna R.
Chumaub River
Ravee River
Beyah R.
Setlege R.
Jumna R.
Ganges
Indus
Hydraspes
Acesines
LAHORE
Amritsir
Sultanpour
Ferozepour
Loodhiana
Kurnaul
Sirhind
Hurreepour
Noorpour
Nadone
Kullanore
Adeenapour
Bijsooly
Sealkote
Jummoo
Rajour
Punnuch
Ruttun Punchal
Peer Punchal
Mooseran
Bholbas
Dutchna
Bember
Jidoon
Mungloor
Mashargur
Tanoul
Pucklioh
Mangtilli
Sulkar
Lukkee
Shahpour
Jhulum
Bebtit
Sumbatte
Gujerat
Wuzeerabad
Rohtas
Rotas
Jhelum
Rhotas
Rhotas Heights
Pirhalagh
Mukkud
Mukkud Nullah
Deenkote
Chowpared
Kanepour
Pilouton
Ismuel Khan
Fatty Khan
Mooltan
Sahawal
Kooshaub
Bhawulpour
Bhawulpour Heights
Bhawulpour Desert
Shujaubad
Bhawulpour
Bhawulpour Desert
Bhawulpour Heights
Bhawulpour Desert
Bhawulpour Heights
Bhawulpour Desert
Bhawulpour Heights

C'est par le recit des Voyageurs qui vont à ce Lac, qu'on connoit la source de ce fleuve; pour avoir quelque chose de plus certain, il faut d'autres recherches.

Just above its exit from the "Camaoun Hills" the Gogra is shown passing through the

reservoir du Sardjou ou Kanar, que l'on bien appeler sa seconde source; ici il est nommé Kanar; ailleurs Sardjou; ailleurs Gagra et Devha...

and nearly 50 miles lower the river passes through the "Cataracte du Kanar[1]".

Bernoulli's publication reached Rennell in time for Tieffenthaler's work to be incorporated into his map of 1788 [pl. 6], and here again he was misled, wrongly assuming that Tieffenthaler had visited Gangotri himself, though Duperron had been emphatic that he had never done so, but had trusted to "des renseignmens qui lui ont été donné par les gens du pays[2]". In his new *Memoir* Rennell discusses at length all the evidence now available regarding the source of the Ganges, concluding with this magnificent picture;

To sum up the whole information, collected from different accounts of the upper part of the course of the Ganges, it appears that the two branches of it, which spring from the western side of Mt. Kentaisse, take course westward, inclining considerably to the north, for a course of about 300 miles; ...when, meeting the great chain...of Mount Himmaleh,which extends from Cabul along the north of Hindoostan, ...the rivers are compelled to turn to the south; in which course they unite their waters, and form what is properly termed the river Ganges. This great body of water now forces a passage *through* the ridge of Mount Himmaleh...and sapping its very foundations, rushes through a cavern, and precipitates itself into a vast bason which it has worn in the rock, at the hither foot of the mountains. ... From this second source...its course becomes more easterly than before, through the rugged country of Sirinagur[3]; until, at Hardwar, it finally escapes from the mountainous tract, in which it has wandered for about 800 B. miles[4].

Five years later he dropped the Lamas' course altogether and corrected his map immediately above Hardwār [pl. 8];

I find that I was misled by the map of the Ganges, made from the materials furnished by the late M. Tieffentaller; having placed the town of Srinagur...on the *north* of Hurdwar; whereas it appears by the observations of some English gentlemen,...in 1789...to lie nearly to the ENE. of Hardwar. The position of Srinagur is at present established, ...on the authority of Capt. John Guthrie[5] who visited it in 1789, ...ascertained by a compass and perambulator. Mr. Daniel...also visited Srinagur the same year, and he gives nearly the same idea...

Some geographical information concerning the upper part of the course of the Ganges and its principal branches, appears at the foot of a...beautiful sketch...drawn by Mr. Daniel; ...the Alucknundra[6] river, which passes under Sirinagur is made perfectly distinct from the Baghretty; ...Mr. Daniel's sketch shows it as a branch which separates from the Baghretty[7] below the cow's mouth, and rejoins it below Sirinagur[8] [pl. 6, 8].

The Lamas' version of the sources of the Ganges was last reproduced in Arrowsmith's *Map of India* published in 1804, and a full review of the misconceptions that had so long prevailed was written by Henry Colebrooke [77 n. 3] in 1809, and published in *Asiatic Researches*[9].

BOGLE & TURNER, 1774–84

As early as 1768 the Directors had expressed a wish for intercourse and trade with Tibet and the countries to the north[10], and they repeated this desire in 1771;

It having been represented to us that the Company may be greatly benefited in the sale of Broadcloth, Iron, Copper, Lead, and other European commodities by sending proper persons to reside at Rungpore, and to explore the interior parts of Butan, Assam, and other countries adjacent to Gaulparah; and as you well know our earnest wish to extend the vend of the

[1] Notes on map at end of Bernoulli, II. [2] Bernoulli, II (282). [3] Srīnagar, 53 J/16. [4] *Memoir*, 1788 (233). An interesting review of this whole subject appeared in *Critical Researches in Philology & Geography*; Glascow, 1824, which is reviewed in *As J.* XVII, May 1824 (512). [5] Account of Guthrie's visit with Thomas Daniel, & his nephew William, the artists; *Ben. P & P.* XLIX (9). [6] Alaknanda, 53 N. [7] Bhāgīrathi, 53 J. [8] *Memoir*, 1793 (368). [9] *As R.* XI, 1810 (429–455). [10] CD to B. 16–3–68; HMS. 356 (185).

staples of this Kingdom to as great a degree as possible, we are surprised you have not already made an attempt to carry so desirable an object into execution[1].

An opportunity came shortly after; early in 1773 an expedition had been sent against the people of Bhutān, who had been invading the Company's territories north of Cooch Behār[2], and on receiving a letter from the Teshu Lama interceding on behalf of the Bhutanese, Warren Hastings took the opportunity to send George Bogle on a mission of goodwill to Tibet[3].

His instructions were chiefly concerned with commerce, but two items refer to geographical matters,

To inquire what countries lie between Lhasa & Siberia, and what communication there is between them. The same with regard to China and Kashmir.

To inform yourself of the course and navigation of the Brahmaputra, and of the state of the countries through which it runs [80][4].

Bogle's official report makes no reference to these matters, and he was particularly anxious to avoid suspicion of having come to spy out the land[5]. In his account of an interview with the Teshu Lama on January 13th 1775 he writes,

That I was exceedingly concerned that Gesub still continued to...imagine that I was come with a design of making an unfriendly account of this kingdom; that I knew nothing about surveying or war; that Mr. Hamilton who was with me, knew as little; that as to the country of Tibet, the Gosain[6], who had been down in Calcutta, could tell him that the Governor had plans of it, and knew the names & situations of the principal places. ...

To tell the truth, I had restrained my curiosity merely in order to counteract the idea of my having come to examine & pry into the country. ... The Lama, upon this, offered to give me a map of Tibet from Ladak to the frontier of China, with the names of places and their distances. This was a splendid object, and to obtain it, I was sensible would reflect much lustre on my commission. ... I replied...in the same style of indifference, after thanking the Lama for his kind offer, that the situation of the country, its strength, forces, &c, were no concern of my constituents...and that in taking a map of this country I would only afford ground for Gesub's suspicions[7].

Bogle was away for 15 months, and, according to Rennell, the only information of geographical interest arising from his mission lay in the details of his route, which ran by way of Cooch Behār, through Buxa[8], Paro in Bhutān, the head of the Chumbi valley, between the lakes Kala Tso and Bam Tso[9], and, down the Painam river through Gyantse to Shigatse[10]; he then crossed the Tsang-po and, reaching "Desheripgay", the residence of the Teshu Lama, on November 12th 1774, stayed there five months[11].

Stewart's interesting account of Tibet, written up from Bogle's letters and reports, appears in the *Philosophical Transactions of the Royal Society*, and, besides identifying the Brahmaputra with the Great River of Tibet [80], records that,

Mr. Bogle divides the territories of the Delai Lama into 2 different parts. That which lies immediately contiguous to Bengal...he distinguishes by the name of Boutan [23 n. 5]; and the other, which extends to the northward as far as the frontiers of Tartary, called by the natives Pu, he styles Thibet[12].

Eight years later a second mission was despatched to Tibet, this time to acknowledge the re-incarnation of the Teshu Lama. Samuel Turner, a cousin of Warren Hastings, was selected for the charge, and with Samuel Davis as surveyor and Robert Saunders as medical attendant [77], followed Bogle's route through Bhutān turning aside to visit Punaka, the capital. Davis was regarded with suspicion on account of his profession and was not allowed to proceed further. Turner published an account of his mission in 1800, which included several sketches which Davis made in Bhutān, as well as a map of his route[13], whilst observations made to the snowy peaks were quoted by Sir William Jones [77]. After this mission of 1783–84, there was no further official intercourse with Tibet for over 100 years.

[1] CD to B. 10–4–71 (16). [2] Dellamcottah Fort captured by Jones (qv.) [229]. [3] Stewart (189). [4] Instructions dated 16–5–74; Clements Markham (8). [5] He took with him a set of D'Anville's maps of Tibet; ib. (cxxix). [6] "Gosseyn Poorungeer" who accompanied Turner and gave useful geographical information to Wilford. *As R.* I (207) & IX (64). [7] Clements Markham (154); See also Bogle's Journal, HMS. 118 (371). [8] 78 F/9. [9] 77 H/7, 8. [10] 77/G/2. [11] Map of Route; Clements Markham (294). [12] Stewart, (190). [13] *Survey of the road from Buxadewar to Tassisudon in Bhutan and...to Teshoo Loomboo in Tibet*; scale 8 m. to an inch; see also MRIO. 91 (2).

In 1786 the Directors wrote out to ask for copies of a "Plan of the Thibet Mountains" and of a "View of Thibet or Bhutan"; apparently in response to this request, the Surveyor General sent home in 1792 a "Plan—*The High Mountains of Thibet and those between Nepaul and the low Countries*"[1]; this has not been found and nothing is known of its authorship.

NEPĀL

We have noticed that various missionaries had travelled through Nepal during the 16th and 17th centuries [69–70], and after they had penetrated to Lhasa, the Capuchin mission established headquarters at Bettiah in 1745[2]. Rennell acknowledges an itinerary, with distances, taken from Father Giorgi's[3] record of the mission, but adds "we are almost entirely in the dark as to the particular direction...[4]". For his maps of 1774 he took

the course of the Gunduck River beyond Soupour[5], and all the places beyond the Bettiah Hills, from a MS. Map made by the Jesuits in Nepaul[6].

There were two official missions sent to Nepāl by the Government of Bengal during the 18th century. The first was an expedition under Captain Kinloch made in 1767, to assist the Rāja of Nepāl in his defence of Kātmāndu against the Rāja of Gorkha.

Kinloch marched a small force of 4 companies of sepoys from Patna through Janakpur, but was held up by a thousand difficulties, and but for knowledge gained of a small portion of the frontier, and the extension of the Company's influence, nothing was accomplished. Kinloch sent maps to the Governor;

I send you his present attack of Cuttmandro & Paton, by which the terrible situation of Jay Percass [Rāja of Nepāl] may be easily seen, notwithstanding the Rudeness of the Work, which indeed is neither Plan, Perspective, or Profile, and altogether out of proportion. It is done by Mactah Under, the man who did the Map which was sent to you[7].

In recommending that Kinloch should be allowed to make a second advance, the Chief at Patna wrote in February 1768,

The knowledge Capt. Kinloch has obtained of that part of the Country, which was before so little known, will be a means of not subjecting him to so many difficulties as he before met with...[8]

and again,

I have delivered to the President some Plans Capt. Kinloch has sent me down, shewing the Rout he intends to take[9].

Robert Kyd made a sketch of Kinloch's route "to Seedly & Harriorpour", beyond the Nepāl border[10].

In 1792 the Gurkhas appealed to Calcutta for help in a war against Tibet; military aid was refused, but a mission under William Kirkpatrick was sent to offer mediation. Starting in February from Muniari up the Baghmati River, it reached Kātmāndu after the trouble had been settled, and returned at once, travelling down the Rapti, and reaching Sagauli[11] on the Gandak in April.

A survey of the route[12] was kept by John Gerard, one of the officers of the escort, and compiled into the map which was published with Kirkpatrick's account of the mission.

The original of the accompanying map is the performance of Lieut. Gerard...who has also the merit of having taken considerable pains in the course of our journey to ascertain with exactness the relative position of places; a task which was rendered the more laborious by the circumspection with which he was obliged to use the compass. As the use of the perambulator was entirely out of the question; and as, owing perhaps to the nature of the country, we did not find the pedometer answer, we had no other means of measuring the distances but by the watch. No doubt this was a very inaccurate method, but we endeavour-

[1] BPC. Feb. 1792. [2] O'Malley (156). [3] b. 1711, near Rimini, Italy; an Augustin Friar; Author of *Alphabetum Tibetanum*. [4] *Memoir*, 1793 (303). [5] Probably Salempur, on the Nepāl border, 63 N/15. [6] IO. Maps. I.AC. 13. [7] BSC. 21–7–67. [8] BSC. 10–2–68. [9] ib. 16–2–68. [10] For all these places *v.* pl. 14. [11] 72 B/9. [12] MRIO. 89 (20 & possibly 22–3).

ed to correct it, in some degree, by comparing notes after each day's journey; and by paying due regard, in our computations, to the varieties of the road with respect to ruggedness or facility. Accordingly we have allowed, in different situations, from two to four miles per hour though it was very rarely indeed after entering the Nepaul territories, that we proceeded at the latter rate. ... It is much to be regretted that we were not able to fix the situation of a few points, at least, of our route by observations of the latitude and longitude. ... We were not absolutely without the means of accomplishing the former of these interesting objects, but as we did not sufficiently understand the management of the astronomical quadrant, ...we were too ill satisfied ourselves with the results of our operations to think them entitled to any confidence[1].

THE SNOWY RANGE

Without going back to the days of Alexander the Great, we will now record the comments made by some of the early surveyors and other travellers on their first sight of the snowy peaks of the Himālaya. We have already noticed the first impressions of Father Monserrate in 1581 [68], and the awe which Father Desideri felt when passing through the mountains into Kashmir and over to the Indus valley [68–9], which contrast with the restraint of the surveyor (probably Bruce) with the first Rohilla compaign of 1774, who indicated the foothills with a simple line of conventional hills, with a further conventional line marked "Mountains covered with snow[2]".

Marshall writes in 1670 [67],

About Morung [pl. 14], which is a great place, are very high hills which upon the 31 July 1671 I see, being at Singhee[3] about 8 Course[4] North from Patna. ... They ly directly North[5] from hence and seeme a vaster distance of [*sic*] than any object my eyees ever beheld. I see them before Sunrise about 2 minutes of an houre, when I could see the sun shine upon the tops of them, which hills seemed about $\frac{1}{2}$ degree above the horizon. These people, when they go thither, they go first to Neopoll and some days journey beyond pass over vast valleys before come to these hills. They go to Botton for Musk, that being the chiefest place where the Musk-deer are. Travelling over the Neopoll hills requires 24 or 25 days time, which being up most vast hills and down vast valleys, the way in a straight line may not be much, and considering the crookedness of the way passing through vast woods etc., and going by Neopoll to Botton, which is out of the way, lying about 1 point of the Compass East of it, and then considering that they come to these hills 4 or 5 days before come to Botton. ... I reckon that the reall distance of these hills from hence may bee in a straight line about 140 Course, which at $2\frac{1}{4}$ mile per Course, make 315 English miles.

Several Arminians and Jesuits which have come from them parts, which come from China, and have travelled the most Countries in the World, say that these Botton hills are the highest hills they ever see or heard of[6].

Rennell saves his emotion for the view of the plains looking back from the hills of the Buxa Duārs,

The southernmost ridge of the Bootan mountains rises nearly a mile and a half perpendicular above the plains of Bengal in a horizontal distance of only 15 miles, and the astonished traveller looks back on the plains, as on an extensive ocean beneath him[7].

He considered the mountains as outside his province, being beyond the frontiers of Bengal, but plate 5 shows that he sketched them in where he could, and intersected occasional prominent peaks; for example, one to the north of Buxa Duār bears the note, "This sharp mountain is seen from Chilmari, Purneah, etc.", and he notes generally that

the Situation of different Peaks in the chain of mountains covered with snow were ascertained by good bases, many parts of it being distinctly seen at distance of 60 miles from the foot of the first chain[8].

He was definitely impressed by their height but attempted no estimate;

They are among the highest of the mountains of the old hemisphere. I was not able to determine their height; but it may in some measure be guessed, by the circumstance of their

[1] Kirkpatrick (5–7). [2] HMS. Vol. 221. [3] Singhiya, 72 G/1. [4] *coss.* [5] "NE. by N. & NNE." p. 137. [6] John Marshall (137–8, 162). [7] *Qy. Rev.* VI, 1811 (303). [8] IO. Maps, I. AC. 13.

rising considerably above the horizon, when viewed from the plains of Bengal, at the distance of 150 miles[1] [23].

and again,

I suppose them to be in point of elevation equal to any of the mountains of the old hemisphere. Indeed the conntry of Thibet is altogether one of the highest in Asia; it being a part of that high elevated tract which gives rise not only to the rivers of India and China, but to those also of Siberia and Tartary. ...[2]

This lack of inquisitiveness puzzled Henry Colebrooke[3], who points out that,

Travellers through Bhutan into Tibet had enabled him to determine, with considerable accuracy, the geographical position of some of the peaks, and establish the important fact that the snowy range was removed by a vast tract of hill country from the plains[4].

Sir William Jones, founder of the Asiatic Society of Bengal, was quick to appreciate the immense height of the peaks, which he saw about a year after his arrival in India; he writes,

Just after sun-set, on the 5th of October 1784, I had a distinct view from Bhagilpoor[5] of Chumalury peak, and the adjoining mountains of Tibet, which are very clearly seen from Perneia[6], and were perfectly recollected by a learned member of our society [Samuel Turner], one of the latest travellers to that interesting country, who had obligingly communicated to me a correct note of the bearings and courses observed in his journey from Rengpur[7] to Tassisudden, and thence through Paradgong to Chumalury[8]. ... From the most accurate calculations that I could make, the horizontal distance at which it was distinctly visible must be at least 244 British miles. ...

By an observation of Mr. Davis [74] at Rengpur, and another at Tassissudden, the difference of latitude between the place last mentioned and Bhagilpoor, is 163 *geographical* or 188 and a fraction British miles; now although the road from Buxadewar in Butan, the latitude of which was found to be 26° 53′, consisted of rough mountains and deep valleys, yet the way between Paradong and Chumalary, especially from...the frontier of Tibet, was very level; and the accuracy of our travellers gives us reason to believe, that their *computed* miles from Tassissudden were but little above the standard; so that having measured the northern sides of the two triangles, formed by their courses WNW. and NNW., we could not be far from the truth. ...

The mountains of Chumalury are the second or third ridge described in the Memoir[9]. The Major justly considers the mountains of Himola, for so they are named by the natives from a word signifying *snow*, as equal in elevation to any in the old hemisphere; and an observation of Mr. Saunders [74] at Perneia, added to a remark of Mr. Smith[10] on the appearance of Chumalury from Moreng, gives abundant reason to think, that we saw from Bhagilpoor, the highest mountains in the world, without excepting the Andes[11].

Henry Colebrooke became a great enthusiast on the subject of the height of the snowy peaks;

His attention was first drawn to this question during his residence at Purnea (1789–93), from which station there is a fine view of the majestic range 150 miles distant[12].

He was the first to attempt to decide the height of the range by observation, and found that an estimated distance of 150 English miles, with elevation of 1° 1′, gave a height of 26,000 feet; he was transferred from Purnea before he could conclude his observations.

Reuben Burrow, during his visit to Goālpāra in 1788 [159], measured a base and fixed all the peaks of the Bhutān mountains that he could, taking panorama sketches, and on his journey to Hardwār took observations to the Kumaun Hills[13] [161],

There are at least two ranges of hills (but I suspect many more); it is the farthest and highest range that is called the Almorah Hills; ...I could not get the name of the nearest range of hills[14].

When he got to Hardwār he took observations to all the peaks he could see from the top of the hills near "Chandyghaut".

In 1796 Thomas Hardwicke, the botanist, visited Hardwār, and travelled up the Ganges as far as Srīnagar[15] [pls. 6,8], making a plot of his route and of the course of the river, and leaving vivid descriptions of the country;

[1] *Memoir*, 1788 (256*n*). [2] ib. 1793 (302). [3] 1st Cousin of Robert Colebrooke [qv.]. [4] Colebrooke (268) & *As R.* XII, 1818 (255–6). [5] Bhāgalpur, 72 K/16. [6] Purnea, 72 O/9. [7] Rangpur, 78 G/5. [8] Phari Dzong. 78 E/2; Chumalhari, 78 E/5, 23,930 ft. [9] *Memoir*, 1783. [10] William Bruce Smith, merchant & indigo factor, Purnea & Nāthpur (Nautpour, pl. 14); HMS. 379 (259–67); had sent a sketch of Kosi R. to SG. *v.* DDn. 131 (89), 8–8–1814. [11] Teignmouth, II (46); see also Colebrooke (268 *et seq.*). [12] Colebrooke (268). [13] 53O; 62 B.C. [14] Journal, IO Maps MS. 5. [15] MRIO. M. 320 (51).

April 27th at Teyka-ka-Maanda. The road continuing with an ascent for about half an hour brought me to the summit of a ridge, from whence is seen the lofty chain of snowy mountains in a very extended line from E. to W. From the distant and indistinct point of view these mountains are seen in some parts of Rohilcund, no just idea can be formed of the sublimity of the scene *here* exhibited, and which every moment appeared with additional grandeur and brilliancy as the rising sun gradually increased his altitude.

One of the most conspicuous summits of this Chain is distinguished by the name of *Hem*; on the base of which...is the famous place of Hindoo worship called *Buddree Nauth*[1]. ... Its bearing from where I made these notes was NNE.

April 28th. Chet Kote. ... I was brought to another view of the lofty snowy mountains, which the moment before were hid by the neighbouring hills, and from the increased elevation of this spot above the one I last saw them from, their magnitude and extent were seen in proportionate degree, but the grandeur of the scene was so infinitely increased, that description must fall as far short of doing justice, as would the pencil of the most eminent artist. ...

April 29th. Had a distinct view of the town and valley of Sireenagur, and the winding course of the Aleeknundra River[2].

Hardwicke discusses the distance of the base of the snowy range beyond Srīnagar, and quotes the descriptions given by Daniel in 1789 [73 n. 6].

We may close with a reference to Kirkpatrick's description of the "terrific appearance" of the snow-covered range as seen during his visit to Katmandoo, and his estimate that one peak "cannot be supposed to be less elevated than the Peak of Teneriffe[3]".

ASSAM: THE BRAHMAPUTRA

Nothing whatever was known of the geography of Assam before the days of Rennell, and most maps shewed the Brahmaputra as a short river not 500 miles long flowing from north to south [pls. 3, 11, 16]. D'Anville shows it as high as "Azzo" [69 n. 7] just above Rangāmāti [pl. 13], and gives the following description ;

Un peu au dessous de Daka, le Gange est joint par une grosse rivière, que sort de la frontirère du Tibet. Le nom de Bramanpoutre qn'on lui trouve dans quelques cartes, est une corruption de celui de Brahmaputren, qui dans le langue du pays signifie, 'tirant son origine de Brahm.' Cette rivière, en remontant conduit à Rangamate et à Azoo, qui sont la frontière de l'état du Mogul[4].

A prominent feature of the old maps was the great lake "Chiamay" lying between Assam and Upper Burma [pls. 3, 11, 16 & p. 48] of which Wilford writes,

The *Brahma-cunda*,[5] from which issues the *Brahma-putra*, is the same which is called *Chiamay* by De Barros [210 n. 6, 221], and other Portuguese writers. De Barros calls the *Brahmaputra* the Caor river, and says that it comes from the lake Chiamay, and from thence it goes to the town of Caor. ...

The Chiamay Lake was said to be 180 miles in circumference. ... Four rivers are supposed to spring from this lake, but except the Brahma-putra, the others must issue from it through subterraneous channels. The *Pauranics*[6] delight in such mystical communications[7].

Herman Moll wrote, before 1722 [209],

Acham. The Lake of Chiamay lies in this Country, betwixt Latitude 25° and 27°, and is, says Luyts, 180 leagues in Compass. The river Cacpoumo runs from it into the Bay of Bengal thro' several Kingdoms, and there are divers other Rivers which fall into it. T'was by sailing up this River that the Moguls first discover'd the Country. Tavernier [qv.] says that several other Rivers flow from this Lake, which he places in the 29th or 30th degree.

In 1765 Rennell took his survey of the Brahmaputra a short distance above Goālpāra, where he was stopped by the Assam frontier posts [20]. He was greatly impressed by the size of the river, and astonished to find it flowing from the east,

[1] Badrīnāth, 53 N/6. [2] Journal, MRIO. M. 349, also *As R.* VI, 1799 (309–81) & *As AR.* 1800. Misc. Tracts. (244). [3] HMS. 295 (10). [4] D'Anville (62). [5] Brahmakund, 92 A/5, located in 1826, at point where Lohit R. breaks from the hills. [6] Hindu sacred writings. [7] *As R.* XIV, 1822 (436–7).

very different to the description given of it in the Maps. ... This River must needs have a very long course before it enters the Bengall Provinces, since 400 miles from the sea it is twice as big as the Thames[1]. ...

and again,

The size of the Ganges has been very much magnified by those Historians who make any mention of it; and on the contrary the Buramputrey, of the largest rivers in the world, has been scarce taken notice of. The Buramputrey 60 miles from the sea is in some places $7\frac{1}{2}$ miles broad, and is navigable for Boats of 150 tons 740 miles above its mouth; its stream is not very rapid, scarce exceeding the rate of 5 miles an Hour during all the above-mentioned space[2].

His observations and enquiries convinced him that the Brahmaputra was identical with the Tsang-po, and he writes,

I have placed Kirganu, the capital of Assam, 160 miles E. by N. from Goalpara, according to the reports of the Assamers. They also informed me, that the Burrampooter has a very long course previous to its entering Assam; and that it comes from the NW. through the Thibet mountains[3]. ...

The Sanpoo ... was supposed by M. D'Anville to the same with that which is called, in the lower part of its course, the River of Ava: but we have now little doubt[4] of its being the same with the Burrampooter. ... It was traced by me in 1765, to about 400 miles above the conflux; that is, as high as the latitude of 26°, longitude 91°; where the Bengal districts and, and those of Assam begin; but I was not permitted to go any higher. ...

The Lamas' map of Tibet in Du Halde [70] describes the course of the Sanpoo to within 120 g. miles of the assumed situation of the capital of Assam; and still nearer to some parts of the Burrampooter that are known, and have been described by the Assamers. These facts together with those respecting the Ava river ... establish (I think) the strongest presumptive proof possible of the Sanpoo and Burrampooter being one and the same river, under different names; and positive proof can never be obtained, but by actually tracing them; a circumstance unlikely ever to happen to any Europeans, or their dependants[5].

He summarised his conclusions in a paper first published in 1781[6], from which the following extract is taken;

Father Du Halde expresses his doubts concerning the course that the Sanpoo takes after leaving Thibet, and only supposes generally that it falls into the gulf of Bengal. M. D'Anville, his geographer, not without reason, supposed the Sanpoo and Ava river to be same, ...for the Burrampooter was represented to him as one of the inferior streams that contributed its waters to the Ganges, and not as its equal or superior. ... Till the year 1765, the Burrampooter, as a capital river, was unknown in Europe.

On tracing this river in 1765, I was no less surprized at finding it rather larger than the Ganges, than at its course previous to its entering Bengal. This I found to be from the east; although all the former accounts represented it as from the north; and this unexpected discovery soon led to enquiries, which furnished me with an account of its general course to within 100 miles of the place where Du Halde left the Sanpoo.

I could no longer doubt, that the Burrampooter and Sanpoo were one and the same river; and to this was added the possitive assurance of the Assamers, 'that their river came from the north-west, through the Bootan mountains'[7].

In 1830, discussing recent discoveries which seemed to confirm the identity of the Tsang-po and Brahmaputra, J. D. Herbert[8] writes,

The paper ... will add another to the many proofs we have of the sagacity of the father of our Indian Geography, Major Rennell, whose very guesses appear better founded than the laboured erudition of other men[9].

But long before Rennell's day Father Desideri [69] had, in his journal of 1715–6, recorded as a definite fact that,

There is one [river] which flowing from West to East traverses the centre of Third Thibet and the province of Kong-to, ... and then turning to the South-East enters the country of Lhoba (Bhutan), whence it descends to Rongmati [Rangamati], a province of Mogol beyond the Ganges into which this principal river of Thibet at last flows[10].

on which De Filippi notes,

This is a clear mention of the Tsang-po. ... That Desideri, alone of the men of his time, should have identified in no equivocal manner the Tsang-po with the Brahmaputra is a notable

[1] La Touche (58). [2] HMS. 765, 31–8–65. [3] *Memoir*, 1788 (219). [4] "we have not the least doubt" *Memoir*, 1793 (298). [5] *Memoir*, 1783 (90–1). [6] *An account of the Ganges and Burrampooter Rivers. Phil. Trans. 1781*; reproduced in *Memoir*, 1788–93. [7] *Memoir*, 1788 (276–7) & La Touche (58 n). [8] Deputy Surveyor General, 1829–31. [9] *Gleanings in Science*, II (66.). [10] De Filippi (127).

fact. Turner, too, at the end of the 18th century, knew that the two rivers were the same; 'the Berhampooter...penetrates the frontier mountains that divide Tibet from Assam. In this latter region it receives a copious supply...before it rushes to the notice of Europeans below Rangamatti, on the borders of Bengal'[1].

Tieffenthaler also had, before 1776, recorded information that the Brahmaputra rose in the Mānasarowar Lake, to emerge through Assam and Rangāmāti [72], and in describing his maps Duperron supports this conclusion, and quotes[2], amongst other evidence, Stewart's[3] account [74];

The city of Lahassa, which is the capital, is of no inconsiderable size; ...The waters of the Great River, as it is emphatically called in their language, wash its walls.

Father Du Halde with great accuracy traces this river, which he never suspects to be the Borampooter, from its origin in the Cassimirian Mountains (probably from the same spring which gives rise to the Ganges) through the great valley of Thibet, till, turning suddenly to the Southward, he loses it in the kingdom of Assam; but still, with great judgement and probability of conjecture, supposes it reaches the Indian Sea somewhere in Pegu or Aracan.

The truth is, however, that it turns suddenly again in the middle of Assam, and traversing that Country, enters Bengal towards Rangamatty under the above mentioned name, and thence bending its course more suddenly, joins the Ganges, its sister and rival, with an equal, if not more copious stream; forming at the conflux a body of running fresh water, hardly to be paralleled in the known World, which disembogues itself into the Bay of Bengal[4].

Dupperon concludes,

Mais c'est toujours une satisfaction réelle pour moi, de me trouver d'accord sur ce point important de Geographie, l'identité du Tsanpou & du Brahmapoutren, réuni au Gange, &c, avec trois Voyageurs instruits: MM. Bogle, Stewart & Rennell, lesquels, comme moi, ont residé dans le Bengale[5].

The earliest trading with Assam appears to have been in the hands of one Daniel Rausch [159], who was established at Goālpāra from about 1768 till his death in 1794 [82]. He never appears to have contributed any information of a geographical character, though he probably knew more about the Assamese of that time than anyone else[6].

WELSH'S[7] EXPEDITION, 1792–4

In 1792 the Governer General received an appeal from the Rāja of Assam to assist him against a wide-spread rebellion, which was being carried on with the help of a large number of "barkandazes", or hired soldiers, from Bengal. On September 10th the Commissioner of Rangpur[8] gave a deplorable account of the state of affairs in Assam; Mr. Rausch had been robbed of Rs. 45,000 worth of goods between Gauhāti[9] and Goālpāra, and recruits were said to be daily passing up from Bengal in large numbers to join the plundering bands[10]. In deputing Captain Welsh to enter Assam, and ascertain the real situation, the Governer General observed,

However extraordinary it may appear to people in Europe, we are under the necessity of admitting that owing to the unremitting jealousy which the Chiefs of those countries have hitherto shown of the English, we know little more of the interior parts of Nipal and Assam than the interior parts of China, and I therefore think that no pains should be spared to avail ourselves of so favourable an opportunity to obtain good surveys and to acquire every information that may be possible[11].

Thomas Wood was appointed surveyor to the expedition, and in December Welsh reported from Gauhāti,

Mr. Wood joined me on the 7th inst. I am employed in gaining every information I possibly can of this country. I intend sending him down to Nugrabura Hill[12] to connect Rennell's

[1] ib. [390 n. 17] quoting Turner (298), who thus aptly described the junction of the Dihang and Luhit below Sadiya (83 M/9). [2] Bernoulli, II (354, 365–9). [3] John Stewart; Writer, Madras, 1763; in 1776, Secretary to Govt., Ft. William; a great traveller; *DNB*. [4] Stewart (194); reproduced in *Annual Register* of 1778. [5] Bernoulli, II (460–4). [6] Formerly an officer of the armies of Frederick the Great, Rausch came to India in 1766, & established a trade agency at Goālpāra; m. Miss Mayo at Rangpur, Oct. 1782; murdered by Assamese, 1794 [82]. [7] Thomas Welsh. Ben. Cav. & Inf.; Cornet 12–9–69...Col. 29–5–1800; d. 11–4–1822. [8] Rangpur Dist. 78 G, to be distinguished from the Assam capital [81 n. 7]. [9] 78 N/16. [10] BPolC. 19–9–92. [11] Johnstone (10). [12] Near Goālpāra, 78 J/12.

survey with this place; as soon as he returns I shall push him on towards Naogong[1] about 7 days journey further up the river[2].

On January 4th 1793 Welsh reported that Wood had reached Gauhāti, having completed the survey up from Nagrabara Hill, and in March, after the rebels had been heavily defeated,

Mr. Wood left this on 4th inst. to survey the river to the Eastward as far as Kolliabar about 100 miles from here[3].

Before moving up the river Wood had surveyed

a route from this place, thro' the country of Drungh[4] to ... the Borders of Bootan, as likewise along part of the present boundary of Assam. ...[5]

Such Remarks on the appearance of the country as occurred to me while passing thro' it, as likewise the little information I could acquire as to the rivers that have their courses thro' Drungh and the interior Division of the country[6].

Of his survey up the river he writes,

I still have about one hundred and forty miles of the Burrampooter River to protract and finish, as likewise the march of Captain Welsh's detachment, from where it left the Boats, to proceed to Rungpore[7] the Capital, and thence to Ghurgong ...[8]

and again, whilst still held up in Gauhāti during the rains,

I am sorry it has not been in my power to obtain any general information respecting the geography of Assam or of the bordering countries, as might naturally have been effected from a person sent up here for that purpose, and I regret the circumstance the more, as the natives are by no means averse to make any communications in their power. ... This circumstance I beg leave to notice for my own credit, lest I might have been supposed inattentive to the purpose for which I was appointed[9].

At the end of October 1793 a detachment was sent up the Brahmaputra to Koliabar, and Wood writes to the Surveyor General,

At last I have got away from Gwahatty to my great satisfaction. I am going up with a detachment. ... I propose taking up my survey at the village of Littoree, where I left off, and hope to be able to send you down by & by, thirty or forty miles more of this wonderful river. I shall in the course of a few days send down my survey of the south side of Gwahatty, and indeed might have done it some weeks ago, had I not been in hopes that the country would have been dry enough to admit of my adding the north side of the river, but after attempting it I found it was impracticable. ... I had an observation of the second of Jupiter's satellites...which agreed so closely with my former ones, that I think the longitude I gave you for Gwahatty is very near the truth indeed. I have likewise made several observations for the variation of the compass[10].

In January 1794 Welsh left Gauhāti in company with the Rāja, with the intention of restoring him to his capital at Rangpur, but while he was still at Koliabar, his advanced force had a fierce engagement with a large body of the "Moamaria" rebels, who were opposing the march to Jorhāt[11]. Wood [qv] gives a vivid account of this action, in which he took an active part; Rangpur was occupied without further opposition on March 18th and he concludes his report,

I returned to the boats ... and have continued my survey up to the south of the Dhikani River[12]. I am now going up that river [Brahmaputra] with the fleet as near to Rungpore as we will have water, but am disappointed in surveying it. The banks are perpendicular on each side, and covered with an impenetrable jungle. So soon however as I get up to Rungpore, I mean to survey down the road we first marched up, at the commencement of which I left a mark, doubtful of being able to survey up the Dhikani at this season of the year, and I am happy I did so, as I shall be able without any great trouble to lay down the situation of the Capital[13].

The expedition was now recalled;

A small force, ably commanded, had advanced many hundreds of miles into an unknown country vanquishing enemies vastly superior in number, settling...the county as it proceeded. ...

Sir John Shore[14]...now ordered Welsh to return to British territory by July 1st at latest. ... On 25th May Welsh left Rungpoor on his downward voyage. The Rajah wrote many

[1] Nowgong, 83 B/11. [2] BPolC. 21–12–92 (20). [3] BPolC. 22–3–93 (33). [4] Darrang Dist. 83. B. [5] Map, MRIO. 36 (34). [6] BPolC. 11–10–93. [7] Rangpur Palace, 2 m. S. of Sibsagar, 83 J/9. [8] Gargaon Palace; BPolC. 28–6–93 (41). [9] DDn. 88 (9), Sept. 1793. [10] DDn. 88. (13), Oct. 1793. [11] 83 J/1. [12] Dikho R., joins Brahmaputra 83 J/5. [13] DDn. 88, April 1794. [14] Writer, 1762; Succeeded Lord Cornwallis as GG. in 1794; cr. 1st Baron Teignmouth, 1798.

letters to Calcutta begging that the troops might remain. The troops arrived at Goalpara on 3rd July leaving the country...a prey to anarchy. The Rajah was soon deposed, and many of the leading men fled to British territory. ... Mr. Rausch was shortly afterwards murdered by the Rajah of Darrang[1].

Wood brought his surveys down to Calcutta where he spent several months drawing his maps[2].

This was the first visit ever made by the British into Assam and no further attempt was made until the Burmese war which started in 1824, exactly thirty years later.

THE EASTERN FRONTIER

Sylhet had nothing to do with Assam till late in the nineteenth century; it formed part of the provinces ceded to the Company in 1760, and was surveyed by Rennell himself between 1768 and 1771, though another surveyor had visited the province as early as 1763.

In 1762 the Rāja of Manipur, or "Meckley"[3], sent an agent to the Company's officers at Chittagong, asking for an alliance and protection against the Burmese. Mr. Verelst [22 n. 4], then Chief at Chittagong, sent proposals for such an alliance[4] to Fort William, and was directed to send a body of six companies of Sepoys

to fix a post at Moneypoor, & make themselves acquainted with the Strength and Disposition of the Burmahs, and the Situation of their Country, ...cultivating the further Friendship of the Meckley Rajah...[5]

Verelst led the expedition from Chittagong, across the Fenny river, through Tippera and Sylhet, but

was unable to proceed further than the Country of Kochar on account of the violent rains, and having been canton'd there some time were, upon the Troubles breaking out, recalled to Dacca[6].

A complete survey of the march up from Chittagong is still preserved in Calcutta, and was made use of by Rennell[7] [23]. The survey comprises eight sections and appears good work, but there is no record of the name of the surveyor. One section bears a note,

The road is measured with a Perambulator in statute miles, and laid down on a scale of one inch. The squares are parallels of Latitude & Longitude, each 2 Geographical miles on a propor- tional scale to the other[8].

From a confident reference to his Hadley's quadrant [15], this was undoubtedly the work of Bartholemew Plaisted who had been employed on surveys for the Chittagong Council since 1760 [14]; and it was probably on the recall of the expedition from Cāchār that Plaisted surveyed the rivers and creeks of Sylhet to their junction with the Meghna near Dacca, to which Rennell refers in his *Journal*, June 16th 1765[9]. Rennell also incorporated into his maps "particulars of the road between that place [Cospour][10] and Ava" as described by the guides who accompanied Verelst[11].

On the north frontier of Sylhet, the Rāja of Jaintia caused much trouble and anxiety by raids into the Company's lands, and in 1774 Rennell was consulted as to the best way of putting an end to his hostilities. Though he had never actually crossed the border he had acquired a fair knowledge of the "Khasia & Jaintia Hills"[12].

The Soormah, or Sylhet, River is the General Boundary of the Sylhet Province on the north. ... A chain of high Mountains on the North side runs nearly parallel to its Course, which is from east to west, at the distance of 10 to 16 Miles from it, forming a narrow Tract of flat Country in extent 60 Miles long & from 10 to 16 Broad. This Tract which is known by the General name of Cossyah, or the Country of Freebooters or Plunderers, is subject to Several petty Rajahs, among which the Gentyah Rajah is the principal. His Territories include

[1] Johnstone (39, 45). [2] On scales 1500 yds & 2 miles to an inch; MRIO. 171 (22), 172 (37 & 40), 173 (1 to 17). [3] From Assamese *Makli*, Hobson Jobson (597). [4] confirmed 11-9-63. [5] BPC. 11-10-62. [6] B to CD. 19-12-63 (51). [7] *v.* 5-mile maps, *Companion Atlas*. [8] *Imp. Lib. M & P.* 334 (H). [9] La Touche (46). [10] Near Silchar, 83 D/13. [11] *Memoir*, 1783 (88) & 1793 (298). [12] 78 O.

the eastern part of the above Tract, together with the Hilly Country between that and Assam. His whole Territory may be Reckoned 40 miles long and 30 broad; one half of which is flat, arable Land, the remainder Mountainous. ...

The Western Cossyahs possess the Country between Gentyah & Laour. I understand that they are subject to several distinct Rajahs... & that they are often quarrelling & fighting among themselves. The only Town of note in these Parts is Pundua[1] which is the mart where the Bengall, Assam, and Garrow Goods, are bought and sold. The Cossyahs' Country in General and Especially the western part of it, is woody and almost impenetrable. Their force is very contemtible, both from the smallness of their Numbers, and the nature of their weapons which last are Bows and Arrows & Short Lances, but when attacked in their woods, they are reported to make use of a variety of stratagems to ensure their pursuers.

On the strength of Rennell's advice operations against the Jaintia raiders were confined to the plains, and in due course met with success[2].

In 1787 the Collector of Sylhet reported that,

The Cosseahs inhabit that tract of mountainous country from Laour, the N. W. extremity of Sylhet, to the eastern boundaries of Cachar. The mountains, according to Rennell's calculation, are 1,200 yards high[3], so perpendicular as to be inaccessible to a foreign enemy... [4]

and again,

Considering the situation of Sylhet as a frontier inhabited by timid ryotts, and surrounded by some encroaching neighbours, I cannot but think it advisable to recommend an accurate survey that the Company's limits may be defined, especially toward the Jaintia country[5].

Of the Garo Hills to the west, and of Tripura to the east, Rennell had no knowledge; he writes in 1774,

That part of Rangamatti to east of Burrampooter... [was] never explored, but the mountains that form the Boundary, and even most of the detached hills, were laid down by Bases.

The Eastern part of Tiperah is an entire forest, ...it is not with any certainty known how far this forest extends Eastwards, and the first Territories we hear of beyond it are those of Ava. I am of opinion that the uninhabited tract extends at least 150 miles from west to east, and about 100 from north to south.

The Chingree river is taken from a sketch drawn by a Dutchman who navigated that river during the time it was swollen by the annual rains. The Eastern Boundary of Tiperah is from the reports of the Rajah's people, who made an excursion that way some years before Tiperah was subjected to Bengall. During their journey they saw no habitations except those of the Cookies, who are a kind ot wild men and build their Huts on Trees for the greater security against the wild Beasts[6].

BURMA

Till very late in the 18th century nothing was known of Burma except for scraps of coast-line recorded by navigators[7] and rare observations for latitude; the Irrawaddy was known as far as Ava, but otherwise all was conjecture.

D'Anville makes use of "a Dutch MS. map... for the river of Ava, ...one of its large sheets is missing"[8], probably the same map that according to Rennell, described the river

as high up as the city of Ava itself, which it places in lat. 21° 48′, and also says in a note '*by obns.*', and indeed the whole scale of the map seems to be formed from the difference of latitude.

The difference of longitude, as inferred from this Dutch map, places Ava in 97°, but Capt. George Baker, of whose accuracy I entertain a high opinion, took bearings and estimated the distance, the whole way from Negrais to Ava, and the result corrected by the observation at Ava, 21° 48′, gives the longitude 97° 45′[9], and this longitude I have adopted[10].

Baker was one of several captains[11] of the Company's ships whose observations along the coasts are quoted by Rennell and Dalrymple. His map and "journal

[1] Pandu, 5 m. from Gauhāti, 78 N/12. [2] *Sylhet Dist. R.* I (13) 13–2–74. [3] Height of Shillong Peak 6,441 ft. [4] ib. II (205), 14–12–87. [5] ib. III 113 of 27–12–88. [6] IO. Maps I. AC. 13. [7] Ritchie (app.); *Instructions for the West Coast of Ava* etc., Dalrymple, March 1785. [8] Herbert (70). [9] Ava, 12 m. SW. of Mandalay, 21° 51′ N.; 95° 59′ E. [10] *Memoir*, 1793. (296). [11] Others were George Hayter, Walter Alves & Thomas Forrest [46]; Baker commanded the *Cuddalore* in which Dalrymple sailed to Borneo in 1759.

of an Embassy to the King of the Buraghmahns", made in 1755, were published by Dalrymple, together with the Dutch map above described, and Baker writes,

I must give you a view of the Ava River. The chief river in this Empire, traverses it from North to South, passing Ava and many other Cities; it is generally called by the natives "the river" by way of Excellence, as the Ganges in Bengal, Tsanpu in Thibet, and Kiang in China; all of which are nothing more than appellations, which have abolished the common use of their proper names. ...

This river discharges itself into the sea by a multitude of channels. ... The eastern channel is conjunct with Pegu River, into which that of Ava falls, a little way below Dagoon[1], a very noted Pagoda.

Some Modern Geographers have imagined that of Ava to be the River Yarou, or Tsanpu; the more ancient reckon it the Lukiang; a middle opinion, from the best information I have been able to obtain, appears the most rational.

I am assured, that not very far above Ava there is a very large lake, from whence the river proceeds.

This lake I am inclined to believe, is the receptacle of the many large rivers, which run from Thibet and China towards Ava; it is probably the Chiamay lake of the old maps, though that lake is deemed imaginary, by the omission of it in the modern draughts; out of this lake run not only the Ava River, but those of Siam and Cassay, and probably those of Arrakan, Chatigan[2], and some others on this side[3].

This famous lake is a prominent feature of the maps which accompany Capt. Baker's journal, and indeed of all maps before D'Anville[4] [78, 209].

In 1795 the Bengal Government deputed Captain Symes to visit Ava on a political mission, with Thomas Wood as his assistant and surveyor, and Francis Buchanan as surgeon.

The embassy embarked at Calcutta on February 21st, and called at the Andaman Islands on the way to Rangoon[5]. After a visit to Pegu by river, they returned to Rangoon, and set out again by river on May 29th for Amarapura. Wood's survey was perforce confined to the river and to astronomical observations for the map, which he entitled,

Draught of the River Irrawaddy, or Irabatty, from Rangoon to Ummerapoora, the present Capital of the Birman Dominions, made between the months of May and December 1795. Scale about 12½ miles to an inch[6].

Buchanan spent all his time collecting information about the geography and people of the country, and submitted his materials to Government with the following notes[7],

My original intention was to have taken as a basis Mr. Wood's survey of the Rivers Irrawady and Burampooter, Mr. Rennell's survey of Bengal, Mr. D'Anville's Atlas de la Chine, and the Sea Charts, and with the Assistance of these to have formed a map of all the countries east from Bengal and south from China.

My present seclusion from Books...has made me give up all thoughts of completing... my original intentions,

He suggests that his paper may be communicated to Mr. Rennell or some other Geographer of Distinction. ... The General outline of the discoveries is as follows. That Mukley[8] and Cussay are the same country and not subject to the Burmas;

(2) That to the east of Mukley are a people called by themselves Parloong[9].

(3) That nearly where Mr. Rennell supposes Cussay to be situated, is inhabited by a nation called Go.

(4) That what in Mr. Rennell's map of Hindoostan is supposed to be Upper Siam, is a country which has been long subject to the Burmas, and is called by them Myelapthan. It is in fact the country of M. Loubère's Grands Siams[10].

(5) That the people of Java and Mergui are a distinct nation from both those of Siam and Pegu, and at present subject to the Burmas.

(6) ... accounts of many rude tribes of whom Europeans have scarcely ever heard, ... the Karayn, Kiayn, Kakiayn, and Lowa[11].

[1] Shwe Dagon pagoda, of Rangoon. [2] Chittagong. [3] *Oriental Repertory*, II (iii). [4] The only lakes in this region are Indawgyi, in the Chin Hills, 92 C/8, and Logtak, in Manipur, 83 H/13. [5] Full narrative, Symes. [6] Map, MRIO. 174 (15); there is also a 1/4 inch map, 174 (17) which was probably Wood's first draft. [7] BPolC. 2–6–97 (17 & 18). [8] Manipur [82]. [9] Palaung.? [10] Probably Shans. [11] Karen, Chin, Kachin, Wa.

(7) ... the Loos, Jangomays, Lanyans, and other nations situated between Siam and China[1]. New information...relative to Great Rivers;
(8) The Arakun river is not so considerable as has been supposed; but takes it rise from Hills at no great distance to the North.
(9) That the river coming from Thibet and which is supposed by Mr. Rennell to be that of Araken, is in fact the Keayanduayn[2] or the Great Western branch of the Ava River.
(10) That what he supposes to be the Western branch of the Ayrawade is in fact the Eastern one, which passes by Ava...keeping west from the Province of Yunan.
(11) That the Luckiang, which Mr. Rennell supposes to be the great branch of the Ayrawade, has no communication with that river, but on entering the Burma dominions assumes the name of Tholuayn[3]...and falls into the sea at Martaban.
(12) That the river of Pegue which Mr. Rennell supposes to come from China, is a river from hills about 100 miles from the sea...
(13) That between the Pegue and Martaban rivers there is a lake[4] from which two rivers proceed; the one runs north to old Ava, where it joins the Myeengnaga, a little river of Ava, which comes from mountains on the frontier of China; the other river runs south from the lake to the Sea, and is the Sitang river of Mr. Rennell, but it is by no means a branch of the river of Pegue, as he supposes.
(14) That the rivers of China, which Mr. Rennell supposes to be the heads of the Pegue river are those of the rivers of Siam.
(15) That the rivers of Siam and Camboja communicate by a very considerable branch called the Anan.

Buchanan's charts and papers[5] were passed to the Surveyor General and on to the of Directors, and compiled by Dalrymple, whose map is thus acknowledged by Symes,

I am obliged to the kindness of Mr. Dalrymple for the construction of the general map prefixed to this work, which has been compiled from the materials collected by Dr. Buchanan. ...it is laid down on a contracted scale, being designed merely to point out the relative situation of the Kingdom of Ava, with reference to other countries. ... The materials requisite to give an accurate topographic display of all parts of so extensive an empire, could not be procured during the short period of our residence; but the ability and indifatigable industry of Dr. Buchanan have effected much, to which the astronomical labours of Mr. Wood have considerably added[6].

Wood's map of the Irrawaddy was a careful piece of professional work, and was of the utmost value to the army in the Burmese war, 1824–6, when the experienced surveyor Peter Grant writes,

Since an opinion generally prevails that Amarapoora is placed 10 minutes too far to the eastward, ... the operations of the army provide no conclusive data on this head. ... Yandabu ...is said to be laid down erroneously in Wood's map. I shall add here that I entertain the highest opinion of his general accuracy, and indeed looking to the obstructions thrown in his way, the restraint imposed on him by circumstances his survey of the Irrawady does him the highest credit. Errors in longitude were unavoidable[7].

Again in the war of 1852–3, one hundred copies of Wood's map were specially lithographed and eagerly sought for, whilst Grant's more deliberate survey was apparently overlooked[8].

[1] cf *Gazetteer of Burma*. [2] Chindwin R. 83 O&L, 74 I&J. [3] Salween. [4] This might refer to the Inle Lake, 93 D/14, 15. [5] Original rough sketches, MRIO. 157 (11–38). [6] Symes (ix). [7] DDn. 240, 1825. [8] DDn. 558 (2–4) 24–1–1852.

CHAPTER VI

MADRAS SURVEYS TO 1788

Early Surveys to 1765 — Barnard's Survey of the Jāgīr, 1767–74 — Military Surveys in the South, 1765–75 — Northern Circārs, 1767–76 — Fort St. George & Madras — Pringle & the Gundes, 1777–88 — Kelly and Other Surveyors, 1778–88.

ALTHOUGH the Company had established a factory at Masulipatam so early as 1611 and that at Madraspatam in 1639, over fifty years before the founding of Calcutta, it was not until 1763, that the Nawāb of Arcot[1] ceded the district of Chingleput, which henceforth became known as the *Jāgīr*.

From the earliest days the English had been regarded as the guests of the Nawāb, and during the long struggle with the French from 1745 to 1761, when each side sought the favour of rival princes, it was the support of English arms that enabled Muhammad Ali to establish his succession.

As Nawāb of the Carnatic he was suzerain of practically[2] the whole country "below the Ghauts", from the Kistna to Cape Comorin, and it was part of the price of his friendship, that he expected, and got, the help of the Company's troops in the maintenance of authority over refractory chiefs and subjects.

The war against the French closed with the English in complete supremacy, having warded off the siege of Madras of 1758–9 [98], and followed up with Eyre Coote's decisive victory at Wandiwāsh in January 1760, and the capture of Pondicherry a year later.

Geographical knowledge of the Carnatic was greatly advanced during this long period of war, but not in time to help D'Anville with his map of 1753 [239].

He took his coast-line from the work of Aprés de Mannevillette and other sailors, but did not speak highly of the Portuguese maps of the west coast; he quoted Fathers Vincent-Maria and Noel as authorities for the Malabar coast, and took parts south of Calicut

from a particular map, for which we are indebted to some bare-footed Carmelites, sent to the Christians of St. Thomas, under the pontificate of Alexander VII[3].

He had already made use of the work sent home in 1719 by Father Bouchet for the inland areas of Madura and the extreme south [238], and writes, in French of course,

What we know of Maissur we owe to the Jesuits, whose missions have extended hitherto; ...the representation thereof...is drawn from a particular draught sent me by Father du Halde. In a letter from Father Calmette...the latitude of Shinna–Ballabaram[4] in this inland part of the Carnate, is observed to be 13° 23′; ...it is of great consequence to be thus fixed in some point at so great a distance from the coast[5] [170].

D'Anville found that the Carnatic was so much better known than other parts of India, that he issued his separate map of the Coast of Coromandel on four times the scale of his *Carte de l'Inde*, and observes,

We might mention different parts of Europe, in which geography is less informed, than of many places in Coromandel[6].

The earliest record of survey by a servant of the Company is of "a measured line" drawn from Devicottai[7] to Trichinopoly "by way of Tanjore by Mr. John Barker[8]", at some time before 1751.

[1]Also called Nawāb of the Carnatic; Muhammad Ali, from 1749 till death in 1795; resided in "Chepauk" a mile S. of Ft. St. George. [2]Guntūr Circār remained the *jāgīr* of Basālat Jang till ceded to the Company in 1788 [111]. [3]Herbert (46–9). [4]Near Chik Ballapur, 57 G/11. [5]ib. (56–61). [6]ib. (56). [7]Divicote, pl. 9; A fort at mouth of Coleroon R. 58 M/15. now washed away; captured by English in 1748, & granted to Company by Rāja of Tanjore; *Imp. Gaz. Mad.* II (157). [8]*Memoir*, 1783 (23).

The SOUTH PENINSULA

from Kelly, 1782.

Plate 9



Redrawn and reduced from Robert Kelly's *Index Map* to the Atlas submitted to the Governor General and Supreme Council in 1782 [240–2].

The Political Divisions as shewn by Kelly are thus distinguished:

Maharattas	Green	*Hyder Ally*	Blue
Nizam & Bazla-jung ...	Yellow	*English*	Red
Travancore	Buff		

Though Kelly shows the whole Carnatic as English, full possession was not obtained till 1801 [107 n. 6].

Names shown in brackets are taken from map published by R. Bowyer, Pall Mall, 1-2-94.

Published at S.I.O. Dehra Dün.

From this time onward many surveys were made by military officers with the armies in the south. There is an undated French route survey, from Palamcottah through the "Royaume de Madura" to Trichinopoly, on the scale of about 3 miles to an inch, in colours[1]. It may belong to the same period as several beautifully drawn plans, showing actions against the French round Trichinopoly during 1753 and 1754[2], made by George Erbb, "Sergt. d'Artillerie au service de l'hon. Co. des Indes Englaisses", then serving in the army of Major Stringer Lawrence[3]. In 1755 William Jennings, also of the Artillery, made surveys round Madura of the marches of Colonel Heron, who was sent "to collect the Revenues in Madura & Tinnivelly" on behalf of the Nawāb of Arcot[4].

Orme gives many large-scale maps of this period in the third volume of his history, mostly elaborate ones of forts or battlefields, and amongst MS. maps at Calcutta is one by Robert Barker of the capture of Kārikāl[5] in April 1760, and one of Pondicherry showing positions of guns, redoubts, &c., at the time of the English attack "in January [1761] in a great storm[6]"; both of which are reproduced by Orme, with some changes[7].

Many of the maps and surveys of this time are signed by John Call, mostly in his capacity as Chief Engineer, as in the case of a

chart of the Madura and Tinnivelly Provinces and part of the adjacent countries, surveyed by the Engineers employed on the expedition against Usoff Cawn in the year 1764, under the direction of John Call, Chief Engineer. 5 miles to an inch[8].

One of these engineers was probably Willam Stevens who was deputed the following year to carry out a survey of the straits[9] between India and Ceylon, with the following instructions;

The communication with our Garrison at Palemcotah & with the Troops in the Tinnivelly Country being very tedious by Land,... and it being of great Importance to have a more easy and frequent communication by Sea between this Country and that of Malabar than the usual Passage round Ceylon,... we are desirous to obtain a certain knowledge whether there is, or is not, a Passage for vessels of 300 tons burthen or more... thro' the bank of sands which is commonly called Adam's Bridge. ...

We have therefore chosen you to go in search of this Channel; ...you are...to proceed towards Ramisseram[10] continuing your soundings from the Station where Mr. Rennell, in the Neptune Snow [47 n. 1] (whose Chart you are furnished with) left off[11]. If you can get through any Channel to the South of Adam's Bridge, you are to continue your soundings & Navigation to Coilpatnam[12] or Purnicale & note in going thither all Rocks & shoals. ...

You will be particularly careful not to give Offence to the People of Ramisseram or any of the blacks You meet, & You must also avoid giving any Jealousy or cause of Complaint to the Dutch, and for this we recommed that you keep at a Distance from the Coast of Ceylon[13].

Stevens carried out his survey in February and March 1765 "without being able to discover any passage for vessels of any considerable Burthen[14]".

The Directors commended this enterprise;

We much approve of your sending Mr. Stevens...to survey the passage between Ramisseram and the Main. We would have you also avail yourselves of the influence you have in the Country whilst Peace & Tranquility subsist, to obtain as perfect a knowledge of every part as possible, and if it were practicable to have exact surveys made of the whole Province of Arcot, it would be a good & useful work; and if such an undertaking should prove agreable to the Nabob, he might probably be willing to bear the Charge; but as this is a delicate affair, we would have you act with circumspection that the Nabob may have no justification for taking offence[15]. [90–1].

Such a proposal had already been made ten years before, without any tangible result, the Madras Council having written home in 1755,

[1] *Imp. Lib. M & P.* 380. [2] Grose, II (133–43). [3] BM. K. 115 (85, 1 & 2) & Addl. MSS. 15739 (12–14); engraved copy faces p. 15 of "Cambridge"; also Orme, III (Maps ref. to I, pp. 314, 346). [4] BM. K. 115 (84, 87) & Addl. MSS. 15739 (11); engraved copy faces p. 83 of "Cambridge"; Orme, I (380–95). [5] 58 N/13; *Imp. Lib. M & P.* 366. [6] ib. 363. [7] Orme, III, last two maps. [8] MRO. Map, 149. [9] Named Palk Straits, after Robert Palk, Governor of Madras, 1763–7. [10] Rāmeswaram, 58 O/7. [11] Rennell's chart, 1763–4, showing "Palk's Streights, with soundings", Orme MSS. 333 (1). [12] Kāyalpatnam, 58 L/2. [13] MS & M. 13–2–65. [14] M to CD. 14–10–65 (55); chart pub. by Dalrymple 20–7–81: IO. Maps II AC. 36 (25). [15] CD to M. 24–12–65 (11).

It might be of great Use hereafter cou'd we obtain an accurate Survey of the whole Arcot Province; and, if possible, we propose to have it done[1].

BARNARD'S SURVEY OF THE *Jāgīr*, 1767–74

In reply to the Directors' further order for the early survey of the lands ceded in 1763 [86] the Council wrote,

What you are pleased to recommend regarding Surveys to be made of the whole Province shall be complied with as soon as proper people can be found for that purpose, and the Engineer is prepairing a Draught of the Company's Jagueer, which shall be sent you as soon as compleated[2]...

and two months later,

Your Chief Engineer has sent Mr. Thos. Barnard, his assistant, to make an exact survey of the Company's Territorial Possessions round Madras; it is a work which will require much time and labour, but we have that confidence in Mr. Barnard's abilities that we doubt not but his greatest Diligence & Attention will be exerted on this occasion[3].

This survey proved to be a long job, especially as Barnard, without any assistants, was expected to combine with his topographical survey a detailed survey and report for revenue purposes, and experienced many interruptions [141–2]. He eventually finished the field work in 1773, and submitted his maps and reports in November 1774, together with a copy of the instructions given him at the start, with the following comments;

It will scarcely...be expected...that they could in any shape be executed through an extent of Country 110 miles in length and 50 in Breadth, by any one person; even tho' he had not the extremities of an Eastern Climate to contend with...the task was much above the powers of a single man to accomplish. ...

The survey commenced in February 1767; in the course of that and the two succeeding years, I was kept from it near a year superintending the repairs of Poonamalee[4] Fort; the war not permitting me to continue it. In 1770 and 1771 another year was lost when I was ordered to attend Mr. Dawson. ... In 1772 I had finished the Survey in part, but not the fair drawings of them[5] [3].

The survey was laid down in 16 sheets on the scale of two inches to a mile, and covered 2,436 square miles[6]. It was reduced later to the $\frac{1}{4}$-inch scale in the Chief Engineer's office, and the reduction was sent home to the Directors and engraved and published by Dalrymple in 1778[7].

MILITARY SURVEYS IN THE SOUTH, 1765–75

Surveys were continually required for a variety of military purposes. During 1765 and 1766 there was much trouble along the frontiers between the Carnatic and Mysore[8], and in July 1765, Government wrote to the officer commanding at Trichinopoly;

Whilst the exact Boundaries of the Country belonging to the Nabob & the Mysorians remains undetermined, We must always expect Disputes & Troubles in those Parts, & if we are on all occasions obliged to send out such considerable detachments as that with Capt. Bonjour, the revenues of the Country will not support the expence. We therefore desire You will procure what information You can with regard to the exact limits and advise us thereof[9].

He replied;

I have people examining the Bounds of Carour[10], Manapar, and Trichinopoly Countries, &c, and when it is done I shall be able to transmit a Plan...of the Nabob's possessions which will enable you to judge of the just rights between him and the Mysorians. In the

[1]M to CD. 10–3–55. [2]M to CD. 22–1–67 (19). [3]M to CD. 21–3–67 (33). [4]66 C/4. [5]MRC. 20–12–74. [6]Report by Mackenzie, 29–11–1810; MRIO. M. 60. [7]MRO. Map 10. also *Oriental Repertory* and Orme MSS. 65 (137). [8]Haidar Ali had seized the Mysore throne in 1761, and was extending his dominions in every direction; *Imp. Gaz. Madras*, I (18). [9]MS & M. 3–7–65. [10]Karūr, 58 J/1.

meantime I...transmit you a sketch of Swamy & Moodu Naique's Countries, but as I have not yet been able to get the measure of them, therefore the scrawl cannot be perfect[1].

Some months later Bonjour was directed "to take a survey of the Passes leading into the Carnatic down the Ghauts"; he "visited all those under the Nabob of Arcot, but not those in the hands of the Mysorians", and reported,

If I have committed a mistake in applying to you for fresh orders, I beg you will attribute it to the different significations of the word SURVEY.

In order to report the Situation of the different Passes leading into the Nabob's dominions, ...I...present you a chart in which I have fixed their positions, and an account of each in particular, mentioning their distance one from the other, as well as from Arcot and other places of consideration. ...

Having used no Quadrant for the observation of the different Latitudes I have regulated myself as near as my remarks could permit, by Mr. Danwill's Geography[2].

Bonjour's survey is thus described by Rennell,

A curious MS...entitled *An Account of the Passes between the parallels of Udeghery*[3] *and Sautgud,* and from which I have received great assistance, has the distances in computed miles from one pass to another, and often from some distant capital place also; but without bearings[4].

In 1767 the Directors write out again,

As an accurate knowledge of every part of the Country may be very useful, We recommended to you last year, to encourage and promote the making of Surveys, with the Nabob's concurrence, of the whole Province; this may be too great a work to be undertaken at once,... therefore it would be well to encourage such of the young officers...as have any turn that way, to make Surveys and draw Plans of the Forts & Districts, where at any time they may happen to be quartered; these if taken with any accuracy, when collected together, may be united into a General Draft; we shall send you...an Instrument, called a Pentagraph, by the help of which the outlines of any Draft may be copied with great ease and dispatch, & with sufficient accuracy.

to which the Council reply,

We have omitted no opportunities of encouragement to obtain Charts and Surveys of the Countries through which our troops have marched, and we hope time and experience will render them compleat, and correct the very erroneous Charts now existing, particularly with regard to the Boundaries and Passes between Mysore Country and the Carnatic[5].

None of the surveys of this period have been found, though Rennell writes,

A variety of MS. Maps of the country lying on the west of the Carnatic, and between it and Seringapatam, have appeared; most of them, I believe, the offspring of the War of 1767–68 with Hyder Ally. ...[6]

A map of the Barra-mahal.[113]. This map is in Mr. Dalrymple's collection, and has much the appearence of general accuracy; the number of Forts placed on rocky eminences... affording an easy means of determining the relative positions by triangles[7].

One of the officers who took a large part in surveys of the Carnatic was Robert Kelly, who in 1778 thus describes his early efforts;

In the course of above ten years service in this country I could not help observing a variety of Distresses and Difficulties which Armies and Detachments have been led into, either by the Ignorance or Villany of Harcarras [95], and the Vast Opportunities which were lost by want of knowledge of the face of the Country even two Miles of our Camp or of the Field of Battle. ... I therefore determined, in the year 1770, to put together the few Observations I had already made, and to continue Surveying every Road I should have occasion to march in future. ...

By the time I had Collected a Number of Observations and thrown them into some form, the Utility and importance of the Work struck me in so Forceable a light that I could not resist the impulse I felt of making it a matter of Public Concern. I consequently wrote a letter to Mr. Du Pré, then Governor[8], ... enclosing him a few rough Sketches of the Roads I had surveyed, and requested to know whether I should continue the Work under the Auspices of Government. ... He laid my papers before the Board and his answer of the 10th of May 1770 conveyed to me the appreciation they had met with[9] [240–1].

[1] MS & M. 16–7–65. [2] A sad distortion of D'Anville's name; MS M & P. 5–5–66. [3] Udayagiri, 57 N/5. [4] *Memoir,* 1793 (280–1). [5] M to CD. 4–11–67 (27). [6] *Memoir,* 1788 (189); account of 1st Mysore War, Bowring (49–58). [7] ib. (191). [8] Josias Du Pré, Governor of Madras, 1770–3. [9] MMC. 22–12–78.

The Governor later told the Board
that when Capt. Kelly went to Trichinopoly he had desired him to take an exact Survey of the Roads & Country in his Journey, and at the same time to consider how far it might be practicable with the assistance of any of the officers and Cadets in the service, who are capable of drawing, to have an exact and accurate Survey taken of the Carnatic. ...

The Board being very sensible of the great advantage & utility of such an Undertaking, it is agreed that the President...apply to the Nabob to obtain his consent to the Survey being taken, and that thereupon the proper Instruments &c. be procured[1].

At the next meeting
the President acquaints the Board that he hath applied to the Nabob for his consent to the taking an exact Survey of the Carnatic, which he had readily granted, and that in consequence thereof, he had enquired of the Engineer regarding the Theodolites and other Instruments required by Capt. Kelly and finds there are none in the Garrison. ...

Resolved that enquiry be made by the Storekeeper, whether any can be procured out of the Europe ships, and if so that they be purchased[2] [203].

No immediate action was taken on these resolutions, and Kelly records that,

I accordingly got together some young gentlemen who understood surveying and drawing, bought Mathematical Instruments and stationery, hired draughtsmen &c, and set seriously about the business.

After I had laboured upwards of a year, without receiving either the appointment or Assistance from Government which they had given me reason to expect, I grew weary and impatient of the task I had imposed upon myself and once more remonstrated to Mr. Dupré, how impossible it was for me to support the expence of so extensive a work, and prayed that I might at least be permitted to send in my bills of unavoidable expences, as the work I had undertaken was solely for the use of the Company.

To this I received a very polite answer, and many promises of service on some future day, but that day never came; though to do that Gentleman's memory justice, I know it was no fault of his that the work was not warmly patronised[3] [241].

In 1771 and 1772, during operations to the southward which resulted in the capture of Rāmnād, Montresor, Pittman, and Dugood carried out surveys over a large part of Madura, Marawar and Trichinopoly[4].

In May 1773 the Commander in Chief[5] put forward a scheme for raising a corps of guides under a Quartermaster-General, whose
main object must be to procure or form as accurate a Chart as possible of all the principal places in the Country, their situations & Bearings from each other, with the nature of the Roads between, and their distance; this he should form on a large scale...with all informations to form a compleat Military Chart[6].

On this the Council reported home;

General Smith delivered in a minute, to show in what manner his scheme could be carried into execution without putting the Company to any additional expence. It was agreed to establish a Company of Guides, & to commence the Survey as soon as the necessary Preparations could be made.

As General Smith recommended Captain Montresor as an officer well qualified for this undertaking, he was accordingly appointed there to; but as to the appointment of a Quartermaster-General[7] it was referred to your Honors. The Siege of Tanjore was soon after undertaken and the death of Captain Montresor...obliged us for some time to lay aside all thoughts of the Survey[8].

A few months later the Council record that
the country being at present in Tranquility, ...it is resolved that the Survey be commenced with all possible Expedition, and that the necessary orders be issued for establishing the Company of Guides at Vellore, from the several Sepoy Carnatick Battalions.

Lieut. Geils being strongly recommended by General Smith — ...resolved...that Lieut. Geils be appointed to the Command of the Company of Guides, and to execute the Survey.[9]

however at a later meeting,

The President reports that on his Application to the Nabob; ...he appeared much alarmed at the idea of Surveying his Country, and requested the undertaking might be set aside, asserting that there was no necessity for a Survey, as the country was abundantly well known. ... The Nabob enumerated many objections Such as that the Company of Guides

[1]MMC. 4–6–70. [2]ib. 11–6–70. [3]BPC. 27–5–82. [4]M to CD. 15–10–72 (48); MMC. 19–10–72, *et seq.* [5]General Joseph Smith. [6]MMC. 10–5–73. [7]QMG. appd. 1778. [8]M to CD. 6–2–74, (38). [9]MMC. 11–4–74.

marching through his Country would be productive of many Disputes with the Inhabitants; that the Villagers would complain of the Sepoys, & the Sepoys would complain of his People for not supplying them with what they wanted; and he further added that the having his Country surveyed would lessen him exceedingly in the Eyes of the Country Powers, as they would immediately conceive that the next step would be to deprive him of his Country altogether[1].

Several efforts were made to break down the objections of the Nawāb, even to the point of offering to place Geils and the company of Guides under his control, but they were of no avail, and the scheme had to be abandonded[2].

NORTHERN CIRCĀRS, 1767–76

The Northern Circārs from Guntūr to Ganjam had long been tributary to the Nizām, and for many years there had been both French and English factories along the coast.

In 1753 Bussy [115] the French commander at Hyderābād obtained from the Nizām the grant of the revenues of four of the Circārs to meet the pay of his troops, and in 1756 he proceeded to establish French authority to the northern limits of Ganjam[3]. In July 1758 he was called down to the Coast[4], and the same year, at the invitation of local chiefs, Clive sent down a force of Bengal troops under Colonel Forde, which defeated the French and re-established the English factories at Masulipatam and elsewhere.

Rennell notes various surveys made during this campaign;

Between Rajahmundry[5] and Vizagapatam, the particulars of the inland parts have been taken chiefly from a large MS. map, in which Col. Ford's marches are described. Between Vizagapatam and Coopilly is taken from another MS. map, seemingly not very accurate[6]. ...

Between Vizagapatam and Jagarnaut[7] Pagoda, an interval of 180 G. miles, the bearings by compass, and distance by a Perambulator, were taken by Major Polier in 1759 (on his return to Bengal with Col. Ford from the Masulipatam expedition)[8].

In 1765 the Emperor of Delhi granted to the Company the *dewāni* of all these Circārs in addition to the provinces of Bengal and the Madras *Jāgīr*, and the following year a treaty was signed with the Nizām for their occupation, with the exception of Guntūr [86 n.2].

The Directors were anxious to avoid further wars, and wrote out,

Respecting your negociations with Nizam...for the Northern Circars, ...Military Expeditions are so expensive & ruinous and their consequences so indefinite, that we shall be better contented to enjoy what we already possess in Peace, than to risk the least part in new Engagements. ... We do not mean to prescribe such bounds as shall prevent you taking advantage of any circumstances which may tend to the Security or Enlargement of our Possessions & Revenues, provided you do not suffer yourselves to be borne away with the ideas of Conquest, which has indeed been too much the case latterly with our Servants in Bengal[9].

However by the time this letter reached Madras General Caillaud had already advanced north of the Kistna into the Circārs[10].

The ocupation was not effected peacefully; in 1767 war broke out with Haidar Ali of Mysore [89], and the Nizām supporting Haidar Ali, Bengal troops under Colonel Peach were sent to the Circārs [26], and marched up through Ellore as far as Warangal[11] to threaten Hyderābād; in March 1768 the Council were able to report the signing of a new treaty by which the Nizām confirmed the cession of the Circārs[12]. Peach's force was then employed "reducing and settling" Ganjam.

[1] MMC 23–5–74. [2] M to CD. 9–12–75. (22). [3] Carmichael (172–5); Maltby (102–10). [4] A term generally applied to the Coromandal Coast, Madras or Pondicherry in particular *Hobson-Jobson*. [5] 65 G/16. [6] *Memoir*, 1783 (66–8). [7] Puri, 74 E/13. [8] ib. (21). [9] CD to M. 24–12–65. [10] M to CD. 1–4–66. [11] 56 O/9. [12] M to CD. 1–3–68.

Various surveyors were employed during these campaigns; Gardiner surveyed the route to Warangal[1], and Cridland the country round Chicacole[2], with "a very accurate survey of the Tickelly District[3]".

Cotsford, sent up to Ganjam[4] at the end of 1766 "to act both as Engineer and Resident", had to return owing to the unsettled state of the country, but was able to give the Chief Engineer a description of the country, with "a plan of Chicacole Circar" and a sketch of the "Town of Ganjam[5]" [3].

In 1768 he was sent up again to establish a factory at Ganjam with the support of Peach's brigade, and in October sent in a plan of the district and promised

to send a large and more exact Plan than I am now able, in which I will mark out the different Purgannas & Zemindaries[6].

A year later he sent a small scale "Plan of the Itchapour[7] District" [93].

In 1767 the Council at Masulipatam proposed to order Stevens, their engineer, to make a survey of the whole frontier towards the Nizām's territories[8], and in 1771 they write that,

Before we determine on building new Forts, it is absolutely necessary that we should have a more accurate knowledge of the Geography of the Country, a Survey of which should be taken as soon as possible, in which should be ascertained the Limits of the Circars, the Bearings & distances of the several places, the most remarkable Passes, & the Roads leading to them[9],

and Government reply that the senior engineer,

Major Mitchell, will either reside at Masulipatam to carry on the works there, or proceed to survey the several Forts in the Circars, or proceed to make a general survey of the Country as may appear most advisable[10].

It was Stevens, however, who was more often on survey; and in 1773 he was selected for charge of the southern section of a survey of the Circārs for which the Chief Engineer[11] made the following proposals;

As the Circars are very extensive & as the Survey of them which is now resolved on, is a great and useful undertaking, I think as many people as can be properly spared, should be employed on that service. ... For which purpose I would have the Surveyors formed in two divisions, under Captains Stevens & Pittman, with as many intelligent Assistants as can be procured.

As Capt. Stevens has already surveyed a considerable part of the most Southerly Circar[12], I recommend that he, with at least one Assistant, should be directed to finish them, compleating the most Southerly parts first, and then to work Northwards; that Capt. Pittman in like manner should begin to the Northward, where Mr. Cotsford has left off, and work towards the South, until he meets Capt. Stevens. Both these Gentleman should be directed to intersect the same stations, that their Surveys may correspond when closed.

They should be directed to ascertain the Company's Boundaries with Precision; the Courses of the Rivers, the direction of the Roads, together with the Inlets from the Country by which an Enemy can enter it. ...

The Engineers are from time to time to forward their Surveys to the Chief of the Settlement under which they may act, who will transmit them to the Board [196][13].

Detailed instructions to this effect were sent to Stevens and Pittman, and James Johnston was sent as assistant with Pittman. Suitable letters were written to the Chiefs at Masulipatam & Vizapatam, and the following to Cotsford at Ganjam,

You will be pleased to inform Mr. Stratton [at Vizagapatam] how far has been Surveyed to the Southward of Ganjam, that he may give the Necessary Direction to Capt. Pittman. We desire you will transmit to us Drafts of the Surveys which may have been made in your District[14].

Pittman was instructed to

begin in the Tickally country, and having compleated the same to go from thence to Jolmore & Kimmedy[15], which are the Northernmost parts of the Chicacole Circar, on this side the Itchapore District[16].

At the end of the year Cotsford handed over charge at Ganjam, and submitted his final maps, before proceeding on furlough:

[1] *Memoir*, 1793 (214). [2] 65 N/15. [3] Tekkali, 74 B/2; *Memoir*, 1783 (68); Map, on ½" scale MRIO. 140 (1–6). [4] 74 E/3. [5] MMC. 25–5–67. [6] ib. 13–10–68. [7] Ichchapuram, 74 A/12. [8] ib 2–11–68. [9] ib. 24–6–71. [10] Map by Mitchell, recorded in M. 339, ib. 3–4–71. [11] Patrick Ross. [12] Rennell acknowledges much information from these surveys by Stevens; *Memoir*, 1783 (*passim*). [13] MMC. 2–3–73. [14] ib. 30–3–73. [15] Jalmur, 74 B/2; Parlakimidi, 74 B/1. [16] ib. 19–7–73.

Accompanying this letter You have a general Plan of the Itchapoor District, which view serves to explain what I have written; a great Part of it is from an Actual Survey, but the state of the Country has hitherto prevented an exact Survey of the whole to be made, so that I have not been able to shew the separate Purgunnahs & Zemindaries in it[1] [92].

This map was afterwards published by Dalrymple, scale 2½ miles to an inch, and described by Rennell as "Mr. Cotsford's elegant map[2]" [3].

Stevens had not been more than six weeks on the survey before he was withdrawn to take a leading part in the siege of Tanjore, and Dugood was sent up to carry on, which he did with many interruptions till the end of 1775; much of his time was spent on the survey of a canal taking off from the Godāvari River [105].

Pittman died in January 1775, and Johnston carried on till his health broke down at the end of the following year when he was transferred to other duties. During the latter part of the survey assistance was given by Charles Maxtone, of the civil service, an officer who made other useful surveys later on [143].

There is a very old undated map of the Ganjam District in the Madras Record Office, scale about 1½ miles to an inch, carried out in pictorial style, with trees, buildings, and hills in elevation, and a marvellous headpiece; it extends from Chicacole on the south to the hills on the north; it is said to have been one of 20 sections[3]. There is also a map entitled "Survey of part of Vizagapatam Circar, including the districts of Chicacole, Bomally, and Teckally", scale 6¼ miles to an inch, with a note "copied from a tracing on china paper, deposited in the Revenue Office, Madras, 1804[4]". Both these maps are probably copied or reduced from the surveys of Pittman and Johnston[5] [252–3].

FORT ST. GEORGE & MADRAS

The earliest known large-scale map of Madras is dated 1710 and inscribed,

Plan of the City of Madras; actually surveyed by order of the late Governor Thos. Pitt Esq.; Engraven, Printed, and sold by Jn. Harris, Newgate St. ... Scale 140 yds. to an inch[6].

This was followed by a map of Madras and its villages, showing village boundaries and names of some streets and gardens, drawn in 1733. The survey was made, and the map probably drawn, by Mr. John Hoxton to assist the repair of defence works[7].

We then find a map shewing Madras at the time of its capture by the French in 1746; the names are shown in both French and English; a very neat map, with little pictures of French ships, inscribed,

A Plan of Madras & Fort St. George, taken by the French commanded by Monsieur Mahè de la Bourdonnais[8] on Sept. 21st 1746. Published by John Rocque, cartographer to the late and present Prince of Wales, 1751. R. Benning, Sculp. ... The corner of Buckingham Street in the Strand[9].

In the British Museum are,

Plan of Ft. St. George, according to Colonel Scott [51], drawn by Robert Barker. ... October 1753. Scale 300 feet to an inch, showing fortifications proposed by Scott[10].

Plan of Ft. St. George and the Bounds of Madraspatnam, Surveyed and drawn by F.L. Conradi, 1755. Plotted to a scale of 60 yards to the inch[11].

Conradi's map was oviously the outcome of an order dated December 31st 1754, that,

A survey of the Company's Present Bounds of Madrass and its Districts be made by Messrs. Hume and Saussure ... under the direction of Mr. Brohier[12], ...

the Directors being advised that,

We have directed a new Survey to be made of your Antient and present Bounds, and some of the Engineer's Assistants are now actually employed on that Business[13].

Orme published two maps illustrating the siege by the French between December 12th 1758 and February 17th 1759 [86], one on the scale of 600 feet to an inch,

[1] MMC. 15–1–74. [2] DDn. 246 (125); *Memoir*, 1783 (68). [3] MRO. Map 424. [4] ib 427. [5] See also MRIO. 137 (8, 25). [6] Love, I (4). [7] ib. II (253). [8] The French Admiral. [9] *Imp. Lib. M & P.* 373. [10] Map, BM.K. 115 (75). [11] Map, BM.K. 115 (76). [12] Engr. in charge, 1751–3; to Ft. William, as C.E., 1757; absconded 1760. Sandes I (115). Love, II (470). [13] M to CD. 10–3–55.

and the larger one 300 yards to 3½ inches. Both are excellently drawn and show much detail[1].

In 1769 the Council

approve the Chief Engineer's plan for fortifying the Black Town, and with regard to the manner of raising a sum for defraying the expence, propose making an Assessment on every House, Garden, and spot of Ground within the walls, according to the value thereof. ... Resolved that Mr. Marsden & Machlin...be instructed to take a regular Survey of each street, to number each house, garden, and spot of Ground, specifying the Name of the Proprietor, and the value thereof, and to affix a board at the corner of every street, with the name of such street wrote in English and Malabar[2],

and at the end of the year Marsden

lays a plan of the Survey before them, with valuation of property and numbers of each lot, and notes of encroachments[3].

The "Book of the Survey" gave the contents of the gardens for each owner in square feet, with their values. Unfortunately a year later Marsden's plan could not be found and Pittman had to be ordered to make a new survey[4]. In September 1771 a civil servant, Eyles Irwin, was appointed to make a survey of all the ground lying within the walls of Blacktown, as many grounds "have been fraudulently obtained since the commencement of the Fortifications"; he was at the same time appointed "Superintendent of the Lands and Grounds belonging to the Town of Madras, St. Thomé, Chippauk and the Environs", and was allowed "20 Pagodas per month for the charges of an horse and Palanqueen for this service"[5] [290].

In 1776 Irwin

lays before the Board a Survey of the whole of Black Town; several setts of Books containing details of properties and waste lands, areas in square feet, and values[6],

however the Committee of Works reported that

M. Irwin has made no report of the Grounds belonging to St. Thomè...nor fixed Landmarks between the Boundaries of Poonamalee & Madras, ...

and the appointment was abolished[7]. The following year,

The many late encroachments on the Public Roads rendering it necessary that an Exact Survey should be had of them, Agreed that Lieut. Schouler be appointed on that service under the Chief Engineer[8].

In 1778 Hugh Maxwell, a Civil Servant, was appointed to be "Superintendent of the Company's Grounds" with the same allowances as were given to Irwin[9], and in 1783 Torriano was appointed to succeed Maxwell[10]. This post was still maintained in 1791 under the designation of "Superintendent of the Company's Lands and Roads" and carried the allowances of a Surveyor.

In 1771 Montresor and Pittman proposed a large scale survey;

Being desirous to render ourselves useful to the Honble Company by performing some Service that may merit their attention, We take the liberty of proposing a Survey of Fort St. George and its Environs of 10 miles in Circumference on a scale of 400 feet to an inch; the utility of such a work is too obvious to require a Detail of the many good Purposes it may assure.

It is an undertaking that will require great Perseverance and Fatigue on our Parts, and should the Proposal be approved of, we flatter ourselves We shall have the necessary assistance granted Us for carrying on so great a Work[11].

The Council approved the scheme, but revoked their approval at a later meeting on the grounds that it should have been made through the Chief Engineer.

In 1776 Dugood was employed on a survey of "the Home Farms", or suburban villages, "particularly describing the Level of the tanks and Water Courses[12]" [142–3].

No further record of town surveys of Madras has been found until 1798, when the Chief Engineer received the following orders;

The Governor in Council has been pleased to fix the limits and boundaries of the town of Madras in the following manner. ... I am therefore directed to desire that a map of the

[1] Orme, III with refs. to vol. II (385, 460); MS. copy of the large-scale map, *Imp. Lib. M & P.* 372. [2] MMC. 27–3–69. [3] MPC. 18–1–70. [4] MPC. 17–1–72. [5] MPC. 20–9–71 *et seq.* [6] MMC. 15–8–76. [7] MPC. 10–12–76. [8] MMC. 24–3–77. [9] MGC. 23–1–78. [10] ib. 12–9–83. William Harcourt Torriano. Writer 1766. [11] MMC. 18–3–71. [12] Mack. MSS. MMC. 2–2–76.

will prove of very essential advantage in correcting many errors which have been observed in the charts of this coast. He has now the pleasure to bring Mr. Topping's journal before the Board, and his observations and remarks appear to him not only ingenious and scientifick, but likewise of utility to Government, from the accuracy with which he seems to have laid down the bearings and distances of the principal stations in the Circars. ... [170–1].

From the laudable anxiety expressed by the Court of Directors, ... Sir Archibald begs leave to recommend...that Mr. Topping be instructed to prosecute his observations along the coast to the Southward[1].

Later in the year the following instructions were issued to Topping;

This Board have come to the resolution of having an accurate survey taken of the sea coast from Madras to the Southmost extremity of the peninsula, with a view not only to ascertain...the *actual line of the Sea Coast*, but...of obtaining a complete Survey of those parts of the Peninsula of India which belong to the Company and to their allies. ...

As soon as the season will permit, you will accordingly lose no time in proceeding upon your survey. ... You will be particularly attentive to ascertain the exact position...of any remarkable town, Pagoda, Point of Land, or Hill; ... you will observe the depth of water, and direction, of the different rivers through which you pass, where they empty themselves into the sea, the depth of water on the bars, and...you will communicate...any remarks about the possibility of making the entrance more accessible to vessels of considerable burthen. ...

If you have it in your power to ascertain the bearings of any remarkable point of land or shoal sea-ward, with the soundings to a certain distance from the shore...by means of any small vessel that you may be able to procure for this occasional purpose, Government will defray the extra expence, ... relying on your prudence to put the Company to as little expence as possible. ...

You will pay particular attention to lay down with the utmost accuracy possible the position, extent, and depth of water upon the Armegon Shoal to the Northward of Pulicat [104 n.2], for although this is not within the limits of the line...for your survey, yet...it is pretty certain that this shoal is very erroneously laid down, in consequence of which some of the Company's ships have been in the most imminent danger of being lost [104]. ...

You can then proceed to survey the rock or shoal where the *Rockingham* Indiaman was lost; ... the shoal of Devicotah [86 n.7]...will also require your attention.

Although it is the intention of the Board that the survey shall be carried on through the Straits of Manar[2] and along the coast of Marawar[3] and Tinnivelly districts to the Southmost point of the Peninsula of India, ...you are for the present to consider these instructions as only extending from the Armegon shoal to the Southmost Termination of this coast... opposite to the Island of Rameswaram[4]; the survey of that Island, as far as the Bramins of these pagodas will permit; from thence round the point of the Peninsula to Koilcarre[5].

Early in January 1788 Topping reported that he had "taken every necessary measure" for his survey, and arranged for correspondent astronomical observations at Mr. Petrie's private observatory [171]. No ship was forthcoming, so the survey was carried out by land, and was the first Indian survey of any extent to have been based on triangulation [191].

Topping sent home an account of this triangulation and a base-line measured at Porto Novo[6] to a friend in London, who read it before the Royal Society on February 16th 1792[7] [191 n. 2] and in a letter to Government in 1791 he wrote,

Totally unaided—except by lascars—I conducted a series of Triangles near three hundred miles in length (besides measuring a Base line of six miles and a half) through a country in which I had to elevate myself for each observation above the tops of the highest trees, to go through the fatigue of travelling some thousands of miles, to endure the rigors of the hottest season, besides the mental labor of taking and computing innumerable astronomical observations[8] [290].

Having carried his triangulation from Madras to Adirāmpatnam[9] on the northern shore of Palk Strait, and surveyed the coast line southwards from Pondicherry[10], Topping returned to Madras in December, expecting to return shortly to complete the survey to Cape Comorin, which however he was never given the opportunity of doing.

[1] MPC. 11-9-87. [2] 58 O/12. [3] Rāmnād, 58 K. [4] 58 O/7. [5] Kīlakarai, 58 K/16; MPC. 30-11-87. [6] 58 M/15. [7] *Phil. Trans.* LXXXII (99). [8] MPC. 27-12-91. [9] 58 N/7. [10] His survey was sent home in 1790, and returned to India many years later; MRIO. 133 (9-11) is possibly part of it.

Goldingham made use of this survey in compiling a

map of Negapatam districts, and part of those dependent on Nagore[1], laid down chiefly from surveys by Mr. G. I. Hoissard in 1791. Corrected by Mr. Topping's survey of the coast. July 25th 1797. Scale 6 miles to an inch[2].

An application to the Governor General for the loan of a "Bombay Cruiser" for Topping's use was not successful, and on his return he looked for a suitable vessel at Madras;

Having...used every endeavour...to procure a small vessel for the marine part of my survey, ... my enquiries, till very lately, have been wholly unsuccessful but...two days ago I very fortunately met with a small well-built cutter of about 30 tons burthen... suited to the purpose. This vessel is quite new, having been launched about three months ago at Pegu, where she was constructed of the very best teak timber...after an English model[3].

He asked permission to purchase it for 1200 pagodas[4], and to spend "the trifling" extra cost of providing copper sheathing to her bottom and a small boat to attend her. As he further assured Governement that she would be

in every way suited to the purpose wanted, and particularly for exploring the passages situated between the Coast of India and Ceylon,

her purchase was sanctioned. Topping indented on the Paymaster for two *candies* of sheet copper for the use of the *Mary*, but,

after much fruitless trouble and vexation, not being able to procure the sort I wanted from the Company's stores, I was compelled to purchase the necessary quantity from a Merchant in the Black Town[5].

In the meantime the Directors had written out welcoming Topping's appointment, and ordering that his first task should be to re-examine the coast for a safe harbour;

It would be of the utmost consequence to have a Port of Shelter for large ships within our own territories on the Coast of Choromandel, and a doubt having been suggested, on attention to Major Stevens's plan of Coringa, whether there be such a passage for a large ship into the river Godavery; but the late dreadful calamity at Coringa[6] may have made essential alterations since Major Stevens's survey was taken [101]; we therefore direct that Mr. Topping be employed as soon as possible in making a survey of the mouth of the river Godavery. ... Possibly planting the mud banks of the mouth of the Godavery with Mangroves might tend to deepen the channel. It will be proper to survey also the road of Coringa to ascertain what shelter it can afford. If...neither the river Godavery nor Coringa can afford safe shelter for large ships we think the Bay of Pettapolly[7] ought to be carefully examined[8].

As Topping estimated that it would take eight months to finish his survey to the south, the Council decided that he should first carry out the survey at the mouth of the Godāvari.

He commenced his survey of the Bay of Coringa in August 1789 and made a thorough survey with soundings, besides taking systematic observations of the tides[9] [191–2]. In his report submitted in February 1790 he pointed out the inaccuracy of former charts, apparently including that of Stevens, made in 1772;

This led the Hon. Court of Directors to expect that a passage for their shipping into the Godavery might be found, ... a matter as will now appear of utter impossibility. ... I have determined to submit the materials with which I have constructed my Chart to their inspection, being of opinion that were the *means* by which all maps and Charts are made exposed to the test of examinations, much fewer impositions would be attempted than are at present practiced, with too frequent success, by persons who depend more on the operations of their own fancy than on their knowledge of things requisite for the construction of geographical documents [184].

Though the passage of ships into the Godavery was quite impracticable, he described the safe harbourage and convenience of the Road of Coringa at every season of the year, and, alluding to a rumour that the object of the Directors was to make Coringa the place of rendezvous for their Bengal shipping, in order to avoid the dangerous, and too often fatal, navigation of the Ganges,

[1]Negapatam & Nagore, Dutch Settlements annexed by EIC. in 1781, 58 N/13. [2]MRO. Map 322. [3]MPC. 8–12–88. [4]About £ 500. [5]The northern quarter of Madras, MPC. 16–6–89. [6]Tidal wave, 1787; *Imp. Gaz. Mad.* I (295). [7]66 A/9 (see pl. 9). [8]CD to M. 20–8–88 (10). [9]MRO. Map. 108.

added that "no place can be fitter for these purposes[1]".

During 1790 and 1791 Topping was employed on arrangements for building the observatory at Madras [172–3], and he wrote in December 1791,

Being at present occupied...in erecting an Astronomical Observatory at this Presidency, it will not be possible for me to proceed on any *distant* service; ... the late heavy monsoon must have impeded not only that, but every other outdoor operation that I might have been engaged in; ... as however the Rivers will probably subside in a few days, I think I may venture to promise that the observatory shall be compleated within three months from the setting in of the fair weather. ...

Although my present occupations will not admit of my immediately commencing my service *Southward*, yet, if the Hon'ble Board approve of my entering upon an examination and survey of the Pullicate and Armegon Shoals[2] *during the present favorable season*, and will allow me the assistance of Mr. Goldingham, I can, as those dangers are not very distant from Madras, arrange to conduct that service. ...

The investigation of these dangerous shoals make a part of my instructions; ... the uncertainty of their true situation and extent has long been an evil very justly complained of; and, if I am rightly informed, the *Vestal Frigate*, with the Right Hon'ble the Governor General on board, had lately a narrow escape of being wrecked or one or the other of them[3].

This was approved, and in the following October Topping reported,

The survey of the Pulicate shoals have been compleated some time but, ... before Mr. Goldingham could accomplish his examination of the Armegon and other Banks to the northward, ... he had the misfortune to lose the cutter's mast and, ... notwithstanding I have searched everywhere for a spare to replace it, I have not yet succeeded in finding one.

In consequence of this disaster I have ordered the lascars to be discharged and the vessel to be secured in Pulicate River, directing at the same time Mr. Goldingham to proceed with his survey *on shore* to beyond the Armegon, in order that by a connected series of observations, in addition to that formerly made by myself, we may at length obtain a true figure of the whole peninsula[4] [178].

In December he reported that

the Survey of the sea coast northward by Mr. Goldingham is going on, and will extend to Point Devy[5] including Pettypolly Bay very shortly.

In March 1793 he submitted

Mr. John Goldingham's survey of the sea coast from Madras to the Kistna, together with a very particular investigation of the Pulicate Reefs[6]. ... As the work will speak for itself, I shall only observe that the method adopted was recommended by myself, and that the execution of it discovers great zeal, application, and ingenuity in Mr. Goldingham[7].

In acknowledging this survey and Topping's letter that accompanied it, the Directors write,

We recommend that the *Mary* be fitted as a Schooner, and the survey of the Bay of Pettipollee and the Soundings on the other parts of the Coast be completed by Mr. Goldingham as soon as opportunity will allow. ...

Although correspondent observations at the observatory are very desirable, yet that consideration cannot be admitted as a competent excuse for postponing the *actual surveys*. ...

Without deprecating the *extreme precision* with which Mr. Topping and his Assistant seem so meritoriously to have executed the survey of the sea Line, and which we wish to have continued, yet there are surveys of more general importance, but none which merit more attention than that of the *Godavary and Kistnah*, as they affect the cultivation of the countries adjacent[8] [105–7].

These surveys of the coast were compiled by Goldingham into a map[9] which bears the following note [192];

The coast from Adiapatnam to Fort St. George (a distance of about 240 miles)...was surveyed by means of a continued series of large triangles, formed with high signals. ... The same method was adopted in the survey of the coast from the Western mouth of the Kistna River to Masulipatam, a distance of about 47 miles. Both these surveys were executed solely by...Mr. Michæl Topping.

The coast from Fort St. George to the Western mouth of the Kistna (an extent of 250 miles) was surveyed by means of high signals ranged along the coast at intervals of 9 or 10 miles, the relative bearings and distances of these having been found by Astronomical

[1]To Dalrymple, 10–7–90, *Mad. Sel.* XIX. 1855 (2,22). [2]6 m. from shore, off present lighthouse Monapalem, 66 C/1; *Imp. Gaz. Mad.* I. (365). [3]MPC. 27–12–91. [4]MPC. 16–10–92. [5]Divi Point, 66 E/1; False Divi Point, 66 A/13. [6]MRO. Map 44, engraved by J. Walker; pub. 1–5–1821. [7]MPC. 19–4–93. [8]CD to M. 23–4–94 (61–64). [9]MRIO. 137 (53) & MRO. Map 125.

observations, and smaller curves ascertained by theodolite and perambulator. The Pulicate Shoals were surveyed by the help of signals ranged on shore. Both these surveys were executed by myself. ...

The coast from Masulipatam to Point Gardewar[1] (about 106 miles) was surveyed by Bearings and distances with the Theodolite and perambulator, by Lt. Caldwell of the Engineers, when Assistant...in the Survey of the Kistna and Godavari Rivers [106].

The Bay of Coringa was laid down from an accurate survey by the late Marine Surveyor.

KISTNA-GODĀVARI IRRIGATION SURVEYS

The first recorded survey carried out for irrigation purposes[2] was one by Dugood on the Godāvari River in 1775 [93];

33 sheets of a sketch showing the Zully Brooke and its environs, from its leaving the Godavary to its joining the Colere. Done to a scale of 8 inches to a mile; ... done large for the purpose of distinguishing minutely the Dams &c.

The canals had been constructed by the local people

to make the Country about them produce Paddy; ... the purpose of tracing the canal was to improve it by deepening, widening, &c, and improve the passage of water;

and with his survey Dugood estimated "the cost of taking away and re-making the dams[3]".

Dalrymple has published an account[4] of a survey of the Godāvari by Walter Lennon in 1786 with a view to the "improvement of cultivation";

Mr. Lennon in 1786 went in a boat up the Godavery & Shevery Rivers, about 180 miles above Rajahmundry[5], and reported on the various tributaries, and that he found no cataracts.

In 1788 Lennon represented to the Governor,

That he had, in 1786, at his own expence, undertaken to make a Survey of the Godavery, upon a scale of one inch to a mile, distinguishing the different districts upon its Bank; ... that his intentions were to begin near Rajahmundry, and to go as far North and West as he should be permitted; he surveyed in this manner about 9 miles of the river. ... What he did was merely for trial of the practicability of the Work.

He now proposed to make an exact Survey of the River Godavery, on a scale of an inch to a mile, and also of the Rivers Shevery & Sheelain...and offered to compleat the whole at his own expence, the only assistance desired, a few lascars; and the only Emolument expected, was the privilege of sending down Teak Timbers, ... secure...from the exactions & plunder of the Zemindars [144].

Dalrymple also reproduces a report from Dr. Roxburgh[6], the botanist, dated October 17th 1792, with

a sketch of the Colar[7], with those parts of the little Rivers that supplied it with water, taken from a manuscript Map, which he believed to be exact, but of this Map no copy is come to England, & Dr. Roxburgh has not an exact idea of the Channel from the Godavery, which was surveyed very minutely by Capt. Dugood.

In 1792 the Directors wrote out,

We recommend that Mr. Topping...may be employed in Surveying the Circars, particularly the Rajahmundry Circar. ... Such a Survey would at once shew, not only the position and nature of the Lands at present in cultivation, and with what cultivated, but ... what Improvements might be made[8].

One consideration of much moment is, the easy communication with the Sea or Water carriage. ... The Inland Navigation of the Rajahmundry Circar is not known to us; it would therefore be of the utmost consequence to Survey Branches of the *Godavery* River as well as of the *Kistna*, ... One very great object is floating down *Teak*, which...might thus be brought by Water to the Sea[9].

The Council passed this letter to Topping and at the same time consulted Beatson, the Governor noting that,

[1] Godāvari Point, 65 L/6. [2] But see 3rd & 4th Instructions to Barnard [142]. [3] Mack. MSS. LXVIII, 27–4–75. [4] *Oriental Repertory*, II; *Watering the Circars*, Dalrymple, 1793, with map. [5] 65 G/16. [6] William Roxburgh, Asst. Surg. Mad. 28–5–76; succeeded to charge Botanical Gardens, Sibpur, 1793. [7] Colair Lake, 65 H/2. [8] See proposals made by Lennon [144]. [9] CD to M. 16–5–92 (11–13).

The late famine in that quarter has again naturally turned the public attention to the practicability of securing water, in future, by means of the two rivers, ... appropriating the waters to the purposes of cultivation, as a point of the first public importance.

Beatson was strongly in favour of

an aqueduct judiciously constructed; ... in forming an aqueduct, there would be no unnecessary slope of descent...which ought not to exceed five inches in a mile, whereby the water would be retained at a high level and would flow so gently as to run no risk of Injuring the work. ...

But as to the probable expence of such a work, it is impossible to form any Judgement, without a Minute Examination of this part of the River; ... in my humble opinion, the Expence cannot be put in competition with the great advantages which would accrue from the accomplishment of such Work.

He further recommended that levels should be taken along the rivers, and Surveys of the Ground, for a mile or two on each side of these levels, to be made, and all original observations of the Surveys & Levellings to be arranged in a clear & distinct manner, so that from them the results may be computed by those who are competent in business of this nature[1].

The necessary instructions were then passed to Topping, who first went down to Tanjore to see the anicut [95 n.6] and study the irrigation system taking off from the Cauvery and Coleroon rivers; he then left Madras in March 1793 for Masulipatam, taking James Caldwell with him as assistant. He made a survey of the Kistna from Masulipatam to Bezwāda,

taking a series of Levels on its northern bank; ... The Godavari River was executed in like manner by Lieut. Caldwell[2].

An account of his levelling operations is given in a report dated February 14th 1794 [192–3], and a year later he wrote, apparently in a mood of depression,

But to particularise a service in which I have laboured these two seasons past, and indeed that on which I indulge Warm hopes of support and encouragement from the Hon'ble Company—Namely *my exertions in the Northern Circars*. In despite of illiberal opposition, and an almost total want of proper assistance, In despite of the rigors of a climate (perhaps the hottest and most unhealthy in the habitable world) I have conducted a series of levels near two hundred miles in length; and a minute survey of the Kistnah, with its several branches, to near a hundred miles from the sea; and I purpose to do the same by the Godavery and its adjacent territory, if life and health permit.

Much has been said, and much written, on this important subject, *The Watering of the Circars*; It will however appear from the delineations already laid before Government, and more fully from those which I shall shortly submit...,that nothing can be more wild and extravagent than the idea of those who recommend undertakings of this kind to be blindly commenced...without method, nay, without first ascertaining the practicability of the scheme, a work of great (but indispensable) labour; ... and, ... supposing the proposed work has...been found practicable, a second survey and series of levels, more minute than those previously accomplished, must also be undertaken, in order to mark out...the ground over which the intended canals are to be carried, to determine their proper dimensions, their figure and slope &c., all of which will require ample assistance and a Band of practical surveyors, well instructed, and capable of enduring the climate[3].

His chart of the "Lower Division of the Kistna", and chart of levels, was sent home to the Directors later in the year, the Council noting that,

This work completes the Kistna from its several entrances to beyond Amuktala, a distance of near 110 miles from the sea, and furnishes determinations of the levels of the adjacent country to that furthest inland point.

Mr. Topping, from want of sufficient materials is still...[anxious] to suspend his judgement upon the practicability of the ultimate object we have in view[4].

After Topping's death in January 1796 the Directors ordered that Beatson should complete the survey, which was now widened in character so as to cover all means by which the irrigation of the cultivated lands in the Circārs could be improved. Beatson came out from home for this special purpose, and left Madras in March 1798, taking with him

a Map of the countries between the Kistna and Gaudavery rivers, with a survey of those rivers by the late Mr. Topping and Captain Caldwell, their lines of levels at every 10th

[1]MRC. 4–12–92. [2]Note on map, MRIO. 137 (53); see also MRIO. 161 (21, 22). [3]MRC. 7–2–95.
[4]M to CD. 2–10–95 (117, 118).

station being marked thereon and also profiles of the levels taken...up the Kistna and across the adjacent country to the Gaudavery[1].

He travelled up to Ellore through

Calastry...Ongole...Chintapilly[2]; ... throughout this tract the objects I have constantly kept in view, were to ascertain the various modes of watering and cultivation—the nature and situation of the best tanks—the different methods of constructing...sluices, and to discover every means of improvement that might be successfully introduced in the Circars.

At Chintapilly, I examined that narrow part of the Kistnah, about a mile above the fort, where the waters are confined between two rocks, in a space of little more than 300 yards; afterwards I proceeded to explore the face of the country on each side of the river, from Chintapilly to Ibrampatam, which...appears to me totally ineligible, and I may add impracticable, for canals or aqueducts, however favourable the levels might have been found.

On his march to Ellore Beatson had employed

several intelligent Bramins of the Corps of Guides, ... in different parts, to ascertain some points connected with the investigation,

and they brought in surveys of the more important rivers flowing through the Guntūr and Ellore Circārs. He goes on to say that,

During this investigation I have often had reason to regret that so small a portion of these districts has as yet undergone an actual survey, and that there is no map of the interior of the circars which could afford me any material assistance. To the late Mr. Topping's and Captain Caldwell's accurate surveys of the Kistnah and Godavery I am indeed much indebted, and to Captain Dugood's of the Wayairoo; but excepting these the rest of the map of the Masulipatam circar is extremely imperfect, being a *Moochy* map, constructed many years ago in the Engineer's office at Masulipatam[3].

Beatson suggested that a similar survey should be carried out in Guntūr Circār to that which he had made some years before in Palnād [110],

At the same time that this Survey is carrying on, I beg leave to recommend that a similar Survey of the rivers in the Guntur Circar (including 2 miles on each side of them, representing principal watercourses from these rivers, villages, and Tanks) be made upon the same scale; this survey with the Routes already surveyed by Captain Mackenzie and myself will form an useful map of that Circar[4].

He was not able to accomplish much, for war clouds were gathering, and in July 1798, the very next month, he was called away to join the Governor General's staff and act as adviser on the geography and local conditions of the Mysore frontier [118]. Topping's scheme was not pursued further;

The first idea of the Godavery Anicut originated with Mr. Michael Topping, who reported how desirable it would be to throw a dam across the Godavery, so as to raise the water, and make it available for irrigation. The project was permitted to slumber for half a century and was revived in 1844[5] [by the great engineer Arthur Cotton].

TANK REPAIRS

The Company having assumed the administration of several of the Carnatic districts from the beginning of the war of 1790[6], and suggestions being made by district officers for the improvement of the revenues from cultivation, the Directors wrote out in 1793,

The Letter from Mr. Andrews of the 16th August 1790, has stated in such forcible terms the advantages which are likely to accrue from cutting a Channel for supplying the Devicotah District with Water from the Coleroon, that we trust no time has been lost in making the necessary previous examination and Survey, and in commencing the Work, if the Report shall have been in favor of the project. ...

We observe by the Letter from the Board of Revenue, ... that from the present ruinous state of the Water Courses and Tanks, it is to be apprehended, that without the aid of

[1] MPC. May 1798. [2] Kālahasti, 57 O/10: Ongole, 66 A/2; Chintapalle, 65 D/2. [3] MRC. 27-7-98. [4] Mack. MSS. LIX, 10-6-98, "A Collection of papers illustrative of the different W terworks in the Carnatic". [5] Mor is (109). [6] In 1781 the Nawāb of the Carnatic assigned to the Company the revenue of his districts to provide for their defence; this was not confirmed by the Directors, but a treaty of 1786 provided for such assignment in the event of another war, and this was put into force in 1790. *v.* M Pol. to CD. 16-9-90 (162). At the close of the war administration of certain districts remained with the Company, and complete transfer followed in 1801 [pl. 1].

Government...no effectual repair will be made by the Renters. ... We authorize you, if the state of your finances shall admit of it, to disburse the Sum...necessary for giving a thorough repair to the Water Courses and Tanks[1], a measure which, ...if effected by skilful Persons, could not fail to induce Proposals for an increased Rent...ultimately attended with a proportionate increase of Revenue[2].

The matter was referred to Topping whose recommendations were eminently practical; he wrote to the Board of Revenue on January 5th 1794;

Your resolution...to recommend a thorough repair of the reservoirs in the Company's Districts, was doubtless a necessary one. Before, however, so extensive a work can with propriety be undertaken, a particular survey of each reservoir, natural or Artifical, should be made, or the Company will certainly be obliged to pay double the money bonafide expended on them.

To effect this salutory purpose, a regular Surveyor General's office should be instituted ...[264].

In the execution itself of the work, ten or twelve *practitioner Surveyors* will be wanted, to act under the Surveyor General and his Assistants; These should, in my opinion, be formed into a regular body, and established in the fixed pay and service of the Company.

The Board of Revenue endorsed this proposal,

We beg leave to recommend that a Surveyor General's office be instituted at Madras, with the authority and the number of assistants, both European and Native, pointed out by Mr. Topping. ...

As you have consented to the repair of the Tanks &c in the Jaghire, and as it would appear that the Hon'ble Court of Directors...intend to extend such improvements throughout the districts under this presidency; we conceive an establishment of this nature to be of the utmost importance, not only to effect the necessary survey of the state of the Tanks, the repairs they require, and where others may with advantage be constructed, but afterwards to Superintend the execution of the works[3].

Government accepted these recommendations so far as the establishment in 1794 of a Surveying School [284], and the following year resolved that,

Being convinced of the necessity of appointing a scientific person to superintend the repair of tanks and watercourses, it is agreed that Mr. Topping be nominated to that duty under the designation of "Superintendent of Tank Repair & Watercourses".

As the execution of the orders which have been received...upon this important subject will necessarily involve the Company in a very heavy expence, and as great responsibility consequently attached to the person employed in the work, resolved that Mr. Topping be allowed...400 pagodas per month in the Revenue Department from the date of his appointment[4].

On Topping's death in 1796 Caldwell succeeded him in charge of the "Department of Tank Repairs", the first regular department of Public Works to be established in India.

Early in 1794 John Norris was deputed "to survey the Devicotta District [86 n. 7] and report on the scheme put forward for its Irrigation". He reported that he considered a survey necessary of all the watercourses, tanks, and communications with the Coleroon River, but he does not appear to have done much towards such survey, for a year later Government told the Chief Engineer that

further employment of Captain Norris at Devicotah is useless and unnecessary. He is to be recalled, and to submit...such materials or information as he may have procured relative to the Survey, upon which he was ordered so far back as January 1794[5].

In his place Caldwell was sent down in 1795 from Masulipatam, "to examine how far the waters of the Coleroon could be applied to water the lands of Devycotah[6]", and in pursuance of his report, the first two boys passing out from the surveying school were sent down to survey the district. The following letter shows that the survey was in the nature of a "Revenue Survey", but as time went on the Department of Tank Repairs developed its own type of survey, and produced district maps for its special purposes which were of considerable topographical value;

In Captain Caldwell's last letter he wrote me that we must make a survey of all the Paddy grounds which are cultivated, and which are not cultivated, and to find the contents of them, and for that, Sir, we want about 50 or 60 bamboos for flags, ... and we do want also a

[1]cf. 5th Instruction to Barnard [142]. [2]CD to M. Rev. 25–6–93 (3, 36). [3]MRC. 10–1–94.
[4]MRC. 7–2–95. [5]Mack. MSS. LXIX, 24–5–95. [6]CD to M. 9–5–97 (52).

person out of the village to shew us the boundary of them, and also to shew us properly which are cultivated, and which are not cultivated. ... We have orders to make a survey of all the salt-water Rivers; for that, Sir, we must have a Boat, to be for our Survey; if Captain Caldwell was here we would have them by his orders, but he, being so distant from us, it is with much difficulty to receive one of his letters in a month, and therefore I have mentioned it to you, Sir. We have not persons enough to cut the jungle as it is so thick between the boundary of Devicottah and also at the Salt-water Rivers. ... We are going on with the nullahs from the Yarry [reservoir]; at present we have rain here most days in the week; Allan desires to be remembered to you, Sir; I hope all our friends are well[1] [195].

On this Goldingham wrote to the Board of Revenue,

It is absolutely necessary for the person these lads are placed immediately under to be on the spot, ready to give them the requisite assistance, and to support them through the opposition they are likely to meet with from persons interested in keeping from Government the information they are ordered to obtain, by which the real value of the country will be ascertained, as well as to give them due encouragement to persevere in the prosecution of a difficult and laborious duty.

Such troubles were of course the lot of all surveyors, though more particularly of those engaged in revenue surveys.

THE CORPS OF GUIDES

On Pringle's death in 1789 Beatson succeeded to the command of the company of Guides [97]. The establishment and composition of the company had been frequently changed; Pringle had left a scheme for 400 men, 100 to be employed north of the Kistna, 200 in the Carnatic, and 100 south of the Coleroon, but the Directors considered these numbers too high;

With reference...to Captain Pringle's proposal for establishing a numerous body of guides ...and the Commander in Chief's opinions of 1773 and 1775 [90] we are led to form an opinion in favour of the utility of some regular Establishment of this nature. ... We are inclined to think that the labours of Colonel Kelly and Captain Pringle have rendered the Establishment of Guides to so large an amount as 400 less necessary than formerly, and we desire to know whether you are in possession of the maps which were presented to the Governor General in Council by the former in 1782 [240]. If not, you must make application for them, and you must inform us whether you really think it necessary to keep up so large an establishment of Guides as Captain Pringle recommends[2].

The Chief Engineer then recommended an establishment one quarter of that suggested by Pringle, but Government only sanctioned 50 men, whom Allan was authorized to raise in time for the war of 1790. During peace time many of the guides had been employed as *harcarahs* under the Governor and the Commander-in-Chief[3].

Both Beatson and Allan were enthusiastic surveyors and it is recorded that,

During the interval of peace, until the commencement of the war with Tippoo in 1790, Captain Beatson was indefatigable in surveying and exploring the whole face of the Carnatic. ... His surveys extended from the River Godavery to Cape Comorin; and by the routes he had selected, especially by the ranges separating the Carnatic from Travancore and Mysore, he had obtained a knowledge of every pass or defile, above 60 in number, which lead through that range[4].

He embodied this work, together with much that must have been collected "from information", into a map of which Rennell writes;

Toom-buddra River, ... the remainder of its course, and its place of junction with the Kistnah[5], is from Capt. Beatson's map of the Coromandel &c., drawn and transmitted to the Court of Directors of the East India Company in 1789. This valuable piece of geography... contains material for correcting a considerable portion of the course of the Kistnah river. ...

[1] From Thomas Turnbull to Goldingham; MRev. Bd. 13–9–98. [2] CD to M. 8–4–89 (25). [3] Mack. MSS. LXIX, 30–1–90. [4] *EIMC.* II (375). [5] 57 I/1.

Capt. Beatson's survey of the Palnaud district [shows the]...Kistnah...to a point more than 90 miles above Condapilly[1]. Thence to Sooropour, or Solapour, is from authorities collected by Capt. Beatson. ...

Balhary[2] 27 G. miles to south-west of Adoni, Beatson's map of 1789. ...

Within those [boundaries] of the Nizam, on the side of Cuddapah and Gooty, the places are taken, chiefly, from Capt. Beatson's map; as are those also in the north Carnatic, Guntoor, and Palnaud[3].

A map of Beatson's preserved at Calcutta is entitled *Countries between the Pennar and Godavari Rivers*, compiled for Sir Archibald Campbell (presumably during 1788–9) [101 n.9]. It is on the scale of 6 miles to an inch and carries the following notes;

The district of Palnaud, the principal points in the Guntoor Circar, and the routes expressed in double lines are from my own survey.—The Masulipatam Circar is chiefly from Major Stevens's map, and Nizampatam...from an original survey by Mr. Scott.—The interior parts, and the routes expressed by the single line, are from cursory surveys by Capt. Alexander Read, and from itineraries kept by Hircarrahs sent to explore the roads[4].

Another map shows "the roads to Madras from Masulipatam drawn by Major Beatson from the report of Hircarrahs"[5].

Beatson's *Military survey of the district of Palnaud*[6] is preserved at Madras, a sketch made in 1787, apparently on a framework of measured roads. Beatson says that he finished in "in about three months, during which time I visited every village and every pass in the district[7]" [193].

His invaluable surveys and reconnaissances made when commanding the Guides during the Mysore War of 1790–2 were sent home with the following note from the Council;

We send the third volume of Capt. Beatson's Geographical Observations in Mysore & the Baramahal[8], with an examination of the Passes, ... to which we added some Military sketches of Hill Forts & of Seringapatam. Captain Beatson will lose no time in arranging the earlier materials into a first & second volume to be transmitted to England[9].

The Directors replied,

The performances of Capt. Beatson, whether of General Geography, or of sketches meant to convey ideas of particular spots of ground for military purposes, ... appear to be executed with great judgement and accuracy. ... The map of Coromandel transmitted by the same dispatch is a monument of great industry, skill, and minute accuracy[10].

Allan's surveys were hardly less valuable and include,

A Survey of the Sea Coast from Fort David[11] to Killay, and of the country in the neighbourhood of Porto Novo and Chillumbrum[12].—Several Surveys of Roads.—A military survey of the Provinces South of the River Coleroon[13].—Fieldbooks and maps of the Marches of the Army under the command of General Medows, from May 1790 to January 1791.—A Field Book of the Marches of the Army under Command of Earl Cornwallis, from February 5th 1791 to May 1792[14].

During 1790 General Medows had worked backwards and forwards along the southern frontiers of Mysore in a vain attempt to bring Tipu to decisive action, and it was in an effort to bring the war to some conclusion that the Governor General, Lord Cornwallis, assumed command of the army in February 1791, and by invading Mysore with a greatly larger force, was able to force Tipu to surrender before Seringapatam in March 1792[15].

Allan gives the following account of his surveys,

Of the Military survey of the Provinces South of the Coleroon, it may be proper to remark that I commenced it in May 1789, and in December following, on the prospect of a war, it became incumbent on me to quit that service and proceed to...Trichinopoly for the purposes of raising a Corps of Guides and endeavouring to investigate...the nature of the country and roads in such parts of Tippoo's Dominions, as were likely...to become the theatre of the future operations of the Army.

[1] Kondapalli, 65 D/10 [pl. 9]. [2] Bellary, 57 A/16. [3] *Peninsula* (4, 10, 13). [4] MRIO. 136 (19). [5] MRIO. 150 (14). [6] W. of Guntūr [pl. 9], MRO. Map 116, & MRIO. 147 (11), Revenues mortgaged to the Company from 24–2–87, *Kistna Manual* (153). [7] MRC. 27–7–98. [8] The hilly tract in the N. of Salem Dist. 57 L. [9] M to CD. 31–7–92 (37). [10] CD to M. 25–6–93 (44, 45). [11] 58 M/14. [12] Chidambaram, 58 M/11; probably MRIO. 133 (12). [13] Fdbk. MRIO. M. 77. [14] MMC. 1–3–93. [15] Account of 3rd Mysore War, Bowring (145–173).

Some parts of the Map are...sketched in from information, and distinguished accordingly. ... In the Field Book of the Marches of the Army under Maj. General Medows, the distances of the Marches from September 14th to October 7th I received from the Officers of Engineers[1] by whom they were measured. After the distribution of the troops in August 1790, ... General Medows approved my making a more minute survey of the country from Caroor[2] to Coimbatoor than my official duties as Captain of Guides with the army had permitted me to do on the March.

One of his maps, entitled "a Map of the Marches of the British Armies in the Peninsula of India, during the Campaigns of 1790, 1791, and 1792" was prepared from a map published by Rennell in London early in 1792, to which Allan added his own later surveys. The map showed all the new boundaries fixed by treaty, the marches of the British and Mysore troops distinguished by different colours, every encampment with its date of occupation, and all the Forts captured during the war[3]. Rennell's map was compiled from maps sent home by Lord Cornwallis;

They consisted of 2 distinct maps, on very large and similar scales (9 inches to a degree); the one containing the capaign of General Medows in 1790; the other that of Lord Cornwallis in 1791. The 1st was compiled by Capt. Allan, who held the office of Capt. of Guides to the Army during the campaign of 1790; the other by Capt. Beatson who held a similar post during the succeeding campaign; and who had previously given very sufficient proofs of his ability as a geographer, by his surveys and remarks made in the N. E. of the Peninsula. Each of these maps possesses a very considerable share of merit, and collectively they describe a chain of positions fixed by cursory measurement, and angles taken from the distant hills[4] [253].

After the conclusion of peace Beatson was appointed Town Major at the Presidency, whilst Allan was appointed to make "a complete military survey of the Baramahal and Salem districts", which had been ceded by Tipu [113]. In submitting the results of this survey, he writes,

I have the honor to lay before your Lordship in Council, several volumes of Geographical observations, made in the countries ceded by Tippoo [287].

The course of that part of the Cavery which forms the Western Boundary is ascertained, as also the nature of the several fords across that river, and the remainder of the Frontier line from the Cavery to Amboor is determined[5].

Early in 1798 Allan resigned command of the Guides, and was relieved by Alexander Orr, who commanded them through the fourth Mysore war, and was in turn relieved by Thomas Sydenham, followed by James Colebrooke in October 1799; these officers upheld the tradition they inherited, and continued to add to the knowledge of the new territories ceded to the Company on the fall of Tipu.

COLIN MACKENZIE

Though he has himself noted that he made his first surveys as early as 1784[6], probably when serving with his battalion in Coimbatore, the first survey made by Colin Mackenzie of which we have any particulars is a "Survey of Nellore and Seropilly with the roads between them...1787...scale 250 yards to an Inch", which the critical Montgomerie classed forty years later as "good"[7]. The following year he made an extensive survey of the roads of Guntūr.

Under the treaty with the Nizām of 1768 [91], the circār of Guntūr[8], granted to the Company by the Emperor of Delhi, remained the *jāgīr* of the Nizām's brother Basālat Jang for his life; Basālat died in 1781 but it was not until 1788 that the Company took possession, as Mackenzie writes,

Guntoor had been a subject of important Political discussion before my arrival in India, but no trace of any attempt to survey it existed in 1788 when the Detachment under Lieut. Colonel Ellington was sent to resume possession of it from the Nizam. At that time I was employed to survey the roads marched by the Detachment, and the principal Forts[9].

[1] Of whom one was Mackenzie [112]. [2] Karūr, 58 J/1. [3] MMC. 1-3-93. [4] Rennell (Advertisement). [5] MRIO. 138/49, *Sketch of the passes between Mugli* [57 K/15] *& Gazalhati* [58 E/2] (showing country between Arcot & Seringapatam) by Allan; sd. Bāramahāl, 30-9-93; Ambūr, 57 L/9. [6] Letter of 19-1-1811; MMC. 8-2-1811. [7] DDn. 246 (142). [8] The Circār was a much smaller area than the present district [pl. 9]. [9] MMC. 19-6-1817.

His detailed account of this survey, illustrated by a couple of maps, was published by Dalrymple [186]. He had commenced

without any fixed appointment, from an opinion of the utility of the work, and which was approved by Government...on my presenting the work[1].

A year later,

A complete survey of the District appearing desirable to Government, in December 1789 I was appointed to survey Guntoor, but after preparing for that undertaking I was ordered to join the Army about to take the Field[2].

He was warned for field service in March 1790 and, joining General Medows's army to the south, made survey of the routes of the army "in the Coimbatoor Country", and also of the fort of "Palgautcherry[3]".

During the campaigns of 1791 and 1792 he served as assistant to the Chief Engineer in Mysore, and on the conclusion of peace was posted as "Engineer and Surveyor with the Ellore Detachment" attached to the Nizām's service [115].

From 1792 to 1794 he surveyed

the newly Ceded Districts of the Nizam, Cuddapah, Canoul, the wild mountains of Yermulla and Nalmulla[4] etc. bounding the Carnatic as far as the Kistna...[5]

continuing his survey of the Penner River through Nellore to the sea [116] and being called away for a few months in June 1793 for the siege of Pondicherry[6]. In 1794 he moved up to Hyderābād, submitting to the Resident a plan, in four sheets, of the passes and roads on the frontier of the Carnatic, between the rivers "Pennar and Kistna" reduced from his surveys[7].

His subsequent surveys north of the Kistna are described later [116–8]. On his journey back from Ceylon

in 1796, I was employed...to take a cursory inspection and view of the Fortresses and Military Posts in the tract between Ongole, Masulipatam and Condapilly[8], including Guntoor. ... No detailed Provincial Map or survey of Guntoor, or of the adjacent Country existed at that time, and I had recourse for the necessary information to my own former Itinerary Surveys of the cross roads, and to Harcarrah routes and sketches supplied by the Collectors[9].

THIRD MYSORE WAR, 1790–92

We have already noticed the surveys of Beatson, Allan and the Guides, and we now come to the work of the Bengal and Bombay surveyors during the third Mysore War.

In November 1790 the Governor General sent the Surveyor General, Alexander Kyd, in advance to Madras to collect information, especially regarding the approaches into Mysore. On his own arrival at Madras, he appointed Kyd as one of his ADC.'s, and during the rest of the war Kyd not only performed the duties of Surveyor General in the field, but also acted as personal adviser on engineering matters.

The chief surveying duty, apart from that carried out by the Guides, was entrusted to Robert Colebrooke who, leaving Madras at the end of January, carried a continuous survey, through Vellore[10] where Lord Cornwallis took over command of the Grand Army, up into Mysore. He ran a series of triangles from Madras to Seringapatam[11], correcting it by numerous observations for latitude; but, though he took several observations for longitude, he did not take these into account, trusting more to the perambulator measurements of the route[12] [175].

His journals contain water-colour sketches and panoramas [187], and his map is very neatly drawn[13]. It is by no means a complete map of Mysore, for it only shows the country along the routes actually marched, crossing and re-crossing the south and east parts of Mysore, with the farther hill ranges sketched where visible.

[1] DDn. 154 (66), 30–1–1817. [2] MMC. 19–6–1817. [3] Palghāt, 58 B/9. [4] Mountain ranges, Erramala, 57 I/2; Nallamalai, 56 P/4 to 57 M/2. [5] DDn. 195 (13). [6] Surrendered 23–8–93. [7] MMC. 28–12–94; MRO. Map 112. [8] Kondapalli, 65 D/10. [9] MMC. 19–6–1817. [10] 57 P/1. [11] 57 D/11. [12] Journals MRIO. M. 120, 134, 142 etc. Map BM. Addl. MSS. 18109 (F), 4 miles to an inch, on one sheet, 28″ by over 4 feet. [13] Original plots, MRIO. 138 (3) etc., 189 (1, 2).

After his return to Calcutta Colebrooke submitted his fair map,

in part, the Result of my labours for two years; it represents, upon a scale of two miles to an inch, such parts of the Mysore country as were traversed...during the campaigns of 1791 and 1792, likewise a part of the country between Vellore and the Ghauts.

I thought it needless to join to this sheet the March of the Army through the Carnatic, as being only a single track, it would have added greatly to the length of the paper, without showing any considerable portion of the country; this part of my work has been projected upon separate sheets.

I shall be enabled likewise, from my journals and field Books, to lay down upon larger scales, plans of Bangalore, Seringapatam, and their environs, and to furnish routes or itineraries showing the distances as measured by the Perambulator...and containing written Descriptions of the Roads, passes, Grounds for encamping, and other particulars.

I have the honor to present with the Map a copy of the astronomical observations, and have ventured also to forward a few pages descriptive of the climate, topography, and History of the Mysore country[1].

In submitting a copy of Colebrooke's surveys for the Directors, Kyd also sent various other surveys and routes collected by him in the course of the war. Amongst these were his own survey made at the conclusion of the war from Seringapatam through Coorg to the sea, and then along the coast to Cochin[2]:— surveys by William Stewart, attached to the Nizām's army, of country round Bangalore and marches through Cuddapah [116];— surveys by Johnson of the Bombay establishment with the Bombay force from Cannanore to Seringapatam[3]:— surveys by Emmitt, also of Bombay, who accompanied the Marātha army [128–30].

By the treaty of Seringapatam signed on March 17th 1792, Tipu ceded to the Company the districts of Malabar, Dindigul, Salem and Bāramahāl [pl. 1 & 9].

DISTRICT SURVEYS

Administrative charge of the Salem and Bāramahāl districts was given to Alexander Read, who was specially commissioned to settle the revenues [144]. One of his first acts was to make a rapid survey which he did himself by planetable, covering the whole area in two months [193]. A copy is still preserved in the British Museum[4];

Sketch of the Countries North & East of the Cauvery, ceded by Tippo Sultan in March 1792; inscribed to Marquis Cornwallis by Alexander Read. Scale about 3 inches to a mile.

Tabular Statement of Revenue, showing the totals for each Tahsildari—Table of Distances—Note on method of Survey—Tehsil Boundaries shown by dotted lines and areas distinguished by different colours.

The sketch, of which this is a copy, was done by the Superintendent...as particularly useful in the management of their civil affairs; ... it has taken only two months thanks to local knowledge, ... what by the usual mode of surveying would be a work for any one man of some years. ...

These considerations, the ease with which surveys of this kind are made, and the great use of which they are in Revenue affairs, may recommend the having similar ones made of all the Companies possessions in Coromandel; especially as with the help of the numerous situations ascertained by astronomical observations, and routes that have been surveyed with proper instruments, they might afterwards be laid down with sufficient exactness for everything in which assistance is derived from Geography.

Allan's "military survey" [111] was but a rough reconnaissance of the roads, so in 1794 Read engaged a civilian surveyor, John Mather, whose work he thus describes;

The first Geographical Survey of these districts was begun in January 1793, and in the August following Government and the Revenue Board of Fort St. George were presented with Maps of them. But as those were only Sketches, and inaccurate, from the slender means and haste with which they were executed, another was begun in August 1794 with

[1]B Pol. C. 19–2–93. [2]MRIO. 150/32–35. [3]Wyld's map of 1843 shows Col. Hartley's route from Calicut through Coimbatore to Mysore. [4]BM. Addl. MSS. 26102 (A).

proper instruments and upon a much larger scale. From its being impossible for the Superintendent of these districts to prosecute a business of that nature and pay due attention to the many other duties of his station, he could only propose to set it on foot, and employed Mr. Mather, a professional surveyor, to carry it on. This extensive undertaking is now finished.

The Superintendant proposes, if circumstances permit, to put the finishing hand to this work himself by performing another circuit of the districts, to examine all the principal points made use of in the survey, and determine their latitudes and longitudes by Astronomical observations. As exhibiting the aspect of the country in respect to Hills, Plains, Woods and Rivers, the true shape and extent of Districts, and as containing every village and tank, it will be one of the most particular surveys of the kind in India, and, relying on Mr. Mather's ability, the Superintendent supposes it will be one of the most correct[1].

This survey of Mather's was indeed the most thorough and complete survey of any district in India made since Barnard's survey of the Madras *jāgīr*; but it was of no value thirty years later, when Montgomerie reported,

The Records of the survey of the Baramahul and Salem Districts executed by Mr. Mather under the direction of Colonel Read, are in a tolerable state of preservation, although considerably wormeaten. The whole tract included in the survey is divided into 25 districts, or Talooks, each of which is laid down on a separate sheet, on a scale of one mile to an inch, accompanied by its statistical tables; there is attached to the memoirs a general map of the district, together with a map shewing the political divisions of the country[2] [194].

Mather says that his survey took 4 years and 3 months, and contained 6,300 and odd square miles, coming to 150 miles annually. His work was so well thought of that Mackenzie was very glad to obtain his services for the survey of Mysore which was commenced in 1800 [9, 119].

When authorizing an establishment of Assistant Surveyors for tank repairs [108], Government directed that they should, when fully trained, be sent out to the districts to make any surveys that might be useful to the district officer.

With this object Goldingham drew up detailed instructions, under which he divided the district survey into two parts, *General*, for topographical detail and *Particular*, for revenue information [145–6]. For the *General* part, he gave instructions for measuring a base—triangulating the whole district—and fixing the village sites [194–5]—and continued,

You will trace out the Principal Roads, and remark on all woods and inaccessible jungles; ascertain the course of all the Rivers and Watercourses; and, to assist the person who may be appointed to superintend the repairs &c. of Tanks, mark the places where Rivers may probably be branched off, so as to prove beneficial to the country by increasing its cultivation[3] [146].

Three boys were sent out from the school to the Dindigul District[4] in January 1797 at the urgent request of the Collector [146–7], and in December two others were sent to Devicottai to work for the Superintendent of Tank Repairs [108]. Others followed to other districts as they were declared fit for independent work, and in the course of a few years most of the districts had useful topographical maps prepared by these young surveyors.

Two of the boys sent to Dindigul succumbed to the climate within a couple of years [285], and were replaced by Turnbull and Allan from Devicottai, who seem to have been kept on surveys of a revenue nature, for in 1799 the Collector, Mr. Hurdis, tried to secure the services of De Havilland to make a complete geographical survey of his district, but, though he made a reconnaissance map covering the whole of Dindigul and Coimbatore, he could not be spared from his military duties for a more regular survey. Hurdis then tried to get the services of Mather, but he was wanted for the more urgent survey of Mysore, and, after trying in vain to get a young Engineer officer "to superintend the boys from the Surveying School", he had to be content with the map that these boys eventually completed by the end of 1801[5].

In 1795 the Collector of Guntūr asked that some officer might be sent to make a complete survey of that *circār*, and pressed for the services first of Mackenzie

[1] DDn. 12; Memoir (I). [2] DDn. 202 (91) 22-3-1825. [3] M Rev. Bd. 22-12-96. [4] 58 F. [5] M Rev. Bd. 12-5-1800 & 14-4-1803.

and then of Orr[1], but neither of them could be spared, and though two boys were sent from the surveying school in 1798, they did not produce the complete survey which the Collector wanted [147].

NIZĀM'S DOMINIONS

In 1775 D'Anville acknowledged that he had received, too late of course for his *Carte de l'Inde* which left the whole of central India blank,

Une grande carte manuscrite, dressé sous les ordres de M. de Bussy, dans son commandement militaire au centre du Deccan[2].

In 1751 Bussy [91] then a lieutenant-colonel, had been sent up in command of a French force to Hyderābād, where his influence had greatly forwarded French interests, though Rennell considered his geographical contributions of far greater importance than his political services;

M. Bussy's marches in the Deccan afford data for fixing the positions of many capital places there, particularly Hyderabad, Aurangabad, Bisnager, and Sanore[3]. But still there are plans of some of his marches wanting, which, could they be procured, would throw much light on the Geography of the Peninsula and the Deccan, such as that from Pondicherry to Cuddapah, Adoni & Hyderabad; that from Aurangabad to Nagpour, and the campaign towards Poonah[4]. ...

Had it not been for these marches of M. Bussy, the only remaining monument to the French nation of their former short-lived influence and power in the Deccan, the geography of these parts would have extremely imperfect; but, as they extend through more than four degrees of latitude, and more than five of longitude, they occupy...the principal part of the Deccan[5]. ...

Few Europeans, vagrant ones excepted, have visited these places since the time of M. Bussy, ...and it is a misfortune to geography that his marches between Arcot, Hyderabad, Adoni, Canoul, and Seringapatam, have not been recorded in the same intelligent manner as the rest of his marches have been. ... But, however I may repine as a Geographer, I ought perhaps, as a philosopher, to be satisfied that so much has been preserved[6].

It is of course most unlikely that Bussy carried out any surveys in person, and it is reasonable to accept the evidence of Duperron that the map, and possibly most or all of the surveys, were the work of one of his officers, Jean-Baptiste St. Paul;

"Les Marches de M. de Bussy dans le *Decan*"; vraisemblement ce sont celles que j'ai vues en 1758, entre les mains de M. de St. Paul...commandant le Détachment des Allemands, au pié de *Doltabad*[7]. Cet officier me dit alors que c'étoit lui-même qui les dressoit d'après les marches de l'armée. ...

Des gens de mérite citent en Angleterre *les Marches de M. de Bussy*, que je crois être les Cartes de M. de St. Paul[8].

In 1773 Orme visited Paris and called on Bussy who gave him a copy of his map of the Deccan, which Orme published in 1782[9]; it covers the area 17° to 21° N. by 75° to 79° E.

Gardiner's survey to Warangal in 1767 [92], appears to have been the only survey of any part of the Nizām's territories by an officer of the Company, till Reynolds passed through in 1788 [128].

In 1790 Lord Cornwallis made treaties with the Peshwa and the Nizām to secure their assistance against Mysore during the campaigns of 1791–2. From the treaty of July 7th 1789, the Nizām had paid a monthly subsidy for two battalions of sepoys and 6 field-pieces, manned by Europeans, a force known as the Ellore, or Madras, Detachment[10]. This detachment marched with the Nizām's army in 1790, and joined the Grand Army under Lord Cornwallis in November 1791. Its marches from Koppal[11] along the north bank of the Tungabhadra to

[1] M Rev Bd. 5–1–98. [2] *Antiquité Géographique*, Preface. MS. map of these marches drawn by D'Anville in 1770 is indexed in BM. Addl. MSS. 15739, but was never received in BM. [3] Savanūr, 48 N/5. [4] *Memoir*, 1783 (viii). [5] ib. 1793 (249). [6] ib. (284). [7] Daulatābād, 47 M/1; rocky fortress standing 600 ft. above the plain. [8] Bernoulli, II (466–7) [9] Robert Orme, I (2). [10] HMS. 563 (126). [11] 57 A/3.

Kurnool and south to Cuddapah[1] were surveyed by MacAlister, who also surveyed the return route to Hyderābād in the following year[2]. Other routes to Hyderābād were surveyed in 1792 by Nuthall and Blunt. After spending the rains at Hyderābād Blunt continued his survey in company with Anburey northwards through Berār to the Jumna [43]. A line through Aurangābād and Bidar was surveyed by William Stewart in 1790 on transfer from Sindha's camp at Agra to join the Nizām's camp at Pāngal[3]; Stewart then accompanied the Nizām's army to Mysore as assistant to the Resident, who instructed him to survey the country, "and in so doing to act with caution so as not to excite jealousy[4]" [127].

Reynolds also surveyed a line northwards from Mysore, through Hyderābād to Agra, during 1792–3 [132], and Rennell made use of his sketch for the "country between Adoni and Palnaud" south of the Kistna, and for "all places within the new boundaries of the Mahrattas, and of the Nizam, in the Dooab" between the Tungabhadra and Kistna[5]. Plates 1 and 9 show generally the extent of the Nizām's dominions south of the Kistna before the cession of this area to the Company in 1800 [119 n.3].

At the close of the war, Mackenzie was appointed to the Subsidiary Force, with directions to make a survey of the districts just ceded by Tipu to the Nizām[6], and then to collect as much material as he could towards the geography of the Deccan, in such time as he could spare from his duties as Engineer;

Having been ordered in April to join the Detachment with the Nizam from the Grand Army as Surveyor and Engineer, and to survey the Routes and to make remarks on the Roads, Forts, Passes, ... I joined the detachment near Bangalore, surveyed with it from thence to Gundecotta[7], & Kurpa[8], from whence I afterwards extended the survey...through the Kurpa, Canoul[9] & Cumbum[10] Circar, examined the passes from these countries into the Carnatic, and, having laid down upwards of 700 miles, hitherto very imperfectly known to Geographers, have been only prevented from carrying it across the Kistna to Hyderabad by an illness contracted...in the Hills[11] [112].

He did not reach Hyderābād till 1794, and during his absence Alexander Orr, Quartermaster with the detachment, had opportunities of making surveys in several directions. Early in 1794 "a rebellion broke out in the districts of Eljundel and Warrangole[12]", and Orr accompanied the detachment which marched up to "Rungapore" and remained there during the rains[13].

At the end of that year the Peshwa declared war against the Nizām who, owing to treaties between the Company and the Marāthas, was not permitted to employ the subsidiary force against them, and dismissed it in disgust; Mackenzie, however, accompanied the Resident with the Nizām's army and surveyed the route to Kharda, where the Nizām was defeated on March 11th 1795. As Emmitt, the Bombay surveyor with the Marātha army, was able to pay a visit to the Nizām's camp, a junction was effected between his survey and Mackenzie's, thereby giving a continuous route between Hyderābād and Poona[14] [130]. On his return Mackenzie obtained special permission to stay in Hyderābād to work up his maps, instead of accompanying the "Madras detachment" on its march down country[15]. As it happened, however, the detachment was recalled in July to help the Nizām against another rebellion, and these marches and counter-marches gave Orr further opportunities to add to his surveys, which were extended in 1796 by an expedition which resulted in the capture of "Rachoor[16]" on April 8th, and return by "Gujinderggur", "Mudgull[17]" and Pagtoor to Hyderābād[18]. Mackenzie describes his first map thus;

All the surveys I had executed myself, with several other measured routes which have been obligingly communicated to me, have been laid down on one general plan connected by such observations as have been made, and connected with well ascertained points extending

[1]Kurnool, 57 I/1; Cuddapah, 57 J/15. [2]MRIO. 150 (47) & Mack. MSS. LXIX, 9–9–91. [3]MRIO. 150/48; Pāngal, 56 L/3. [4]HMS. 614 (205), 12–2–91. [5]*Peninsula*, (4, 9, 13). [6]The greater part of Cuddapah & Kurnool; Aitchison, IX (214–5). [7]Gandikota, 57 J/5. [8]Old name for Cuddapah. [9]Old name for Kurnool. [10]Cumbum, 57 M/2. [11]Mack. MSS. LXIX, 13–2–93. [12]Elgandal; 56 N/3, Warangal, 56 O/9. [13]HMS. 563 (85) & 614 (122). [14]HMS. 446 (19), 560 (108–204), 613 (427, 467). [15]MMC. 18–5–95. [16]Raichur, 56 H/8. [17]Machtal, 56 H/7. [18]Mack MSS. LX (71 etc.); for other marches surveyed by Orr, see fdbks. in MRIO. M. 163 and maps MRIO. 64 (26–30).

north from the parallel of Bangalore to Burhampore[1] about nine degrees of latitude, and extending west from the Sea Coast to Moore Ghaut, whose distance to Poona appears well ascertained. ... On this ground work I have laid down all the Cross-roads and information that could be depended on. ...

All the Chief points being thus laid down as accurately as could be expected...I have now to mark out the parts belonging to each Circar, which I shall be enabled to do with some precision, from the accounts of the Soubahs and Circars which you have been pleased to communicate to me[2].

In October 1795 Mackenzie was called down to command the engineers on the expedition to Colombo, not returning to Hyderābād till January 1797. He then made a survey westwards to Gulburga[3], the ancient capital of the Deccan, but later in the year he was again called away for the abortive expedition to Manila, and whilst at Madras took the opportunity to submit a supplementary map shewing all the material he had been able to add to his earlier map of the Deccan [245][4]. By this time the "Madras detachment" had been withdrawn, and in 1798 he marched up to Hyderābād once more, this time as Engineer with the "Bengal detachment" to which was entrusted the task of disbanding the French corps[5] [175].

During his stay at Madras Mackenzie had obtained the services of a lad from the surveying school and a suitable staff of subordinates, and also an assistant engineer, Benjamin Sydenham, who took part in the surveys and astronomical observations both on the march up from the Masulipatam and after arrival in Hyderābād[6] [175]. Mackenzie writes of his own surveys,

In the Nizam's country all that I have effected, exclusive of the measured routes of the Detachment, has been by availing myself of favourable circumstances as they occurred in the intervals of several years, sometimes yielding, then embracing the lucky moment, and frequently I have been obliged to suspend my operations altogether, as was the case last year when our troops were encamped close to Hyderabad, and performing the most important services to Government[7].

The following extracts are taken from the memoir which he submitted with his map of 1796:

Memoir of the materials and construction of a Map of the Dominions of Nizam Ali Khan, Sobadar of the Decan, compiled and written in 1795 by Colin Mackenzie, Field Engineer & Surveyor to the Subsidiary Force with the Nizam.

The interior Provinces of that part of the Peninsula of India, distinguished by the general name of The Decan, are so imperfectly known to us, that it was imagined any attempt to give a most accurate definition of its extent, limits, internal divisions and natural productions would be acceptable; ...

Independent of these general motives, others more immediately interesting to our Military establishments suggest the propriety of acquiring an intimate knowledge of the roads, fortresses, rivers, passes and strong posts. ...

On the appointment of a Surveyor to the Nizam's Detachment in 1792, it had been recommended that every opportunity if improving our knowledge of the geography of the interior countries should be attended to, and surveys of particular parts of the frontier of the Company's possessions bordering on those of the Nizam were ordered and executed. The result of these and of the marches of the Detachment across the country, opened a wider field for extending them still further. ...

The progress made in this attempt (already interrupted by unavoidable circumstances) was threatened to be finally stopped by the Detachment's being sent back to the Carnatic in 1795; there appeared a danger that the whole would be rendered useless for want of being arranged and brought together, while the authorities on which it had been formed were known or within reach of enquiry.

The want of this precaution had rendered of little use "The Plans of Marches in the Dekan" by Mr. Bussy, and of our Armies in 1767 and 1768, which are become obscure and difficult to reconcile for want of the authorities on which they were constructed.

To prevent this by taking the opportunity of arranging the materials where many advantages of local information could be procured, the permission of the Government of Madras was...obtained for the compiler...to remain at Hyderabad for a limited time, during

[1] Bangalore, 13° N.; Burhānpur, 21½° N. [2] MMC. 17–8–95. [3] 56 C/15; Map, MRIO. 64 (33); Fdbk. BM. Addl. MSS. 13582 (19). [4] MRIO. 66/6; See also BM. Addl. MSS. 13582, "Remarks made on the survey in the Nizam's Dominions in 1797"; C.M. 5–2–98. [5] Effected 22–10–98. [6] Fdbks. MRIO. M 83 & M. 166. [7] DDn. 41; to Resdt. Mysore, 6–12–99.

which the liberal assistance that was received from several quarters...contributed to enlarge the find of authentick documents. ... Though the actual surveys (containing 5710 English miles) may be relied on, and much of the countries adjacent to them are laid down from collateral information that must be tolerably correct, yet many parts are still obscure, particularly the Soubah of Berar which has scarcely any one assured line across it. ... 97,850 square geographical miles were included within the Nizam's boundary; ... the attempt to survey it is subject to many impediments unkown elswhere, ... the prejudices of the religion, political jealousy, and manners differing far from European, present difficulties scarcely to be surmounted[1].

In another place[2] Mackenzie describes his work thus,

In 1792, after the Peace of Seringapatam, I was sent, a Subaltern from the army in Mysore, by the desire of the late revered Lord Cornwallis, with the small detachment at first employed in the Nizam's dominions, for the purpose of acquiring some information of the Geography of these countries, and of the relative boundaries of the several States. ...

From 1792 to 1799 it were tedious to relate the difficulties, the accidents, and the discouragement, that impeded the progress of this design. The slender means allotted from the necessity of a rigid...economy; the doubts and the hindrance ever attendant on new attempts; difficulties arising from the nature of the climate of the country, of the Government; from conflicting interests, and passions and prejudices, difficult to contend with and unpleasant to recollect. ...

In returning to Hyderabad in 1798, for the third time, to resume the investigation of Deckan Geography, measures were proposed, and in part methodized, for analizing the whole Deckan; and before 1799, considerable help was attained by obtaining a copy of the regular official Dufter of the Deckan...as well as certain MSS. of authority. ... The Deckan was in fact then a Terra-Incognita, of which no authentic evidence existed, excepting in some uncertain notices and mutilated Sketches of the marches of Bussy; and in the Travels of Tavernier and Thevenot[3].

FOURTH MYSORE WAR, 1799

This last and conclusive war against Tipu gave little scope for survey operations; for the purposes of the rapid advance on Seringapatam, the surveys already collected were sufficient. Not-but-what Beatson, the most experienced surveyor of the Madras establishment, was selected to join the Governor General's staff, and appointed Surveyor General to the Grand Army, where he soon established himself as one of the most strong-minded and purposeful of the Commander-in-Chief's counsellors. His history of the campaign became a standard authority[4]. Allan was D.Q.M.G., and took a leading part in reconnaissance, and has left a most interesting account of the campaign[5]. Orr commanded the Guides.

From the survey point of view the most interesting feature of the campaign was the march of the Nizām's army from Hyderābād to join the Grand Army at Āmbūr[6]. A complete survey of the route was kept by Mackenzie and Sydenham, starting from Hyderābād on December 16th, and reaching Āmbūr on February 21st 1799[7]. The Nizām's force was then placed under the command of Lt. Colonel the Hon'ble Arthur Wellesley[8], who brought his own regiment, the 33rd Foot, to stiffen it. Mackenzie remained as his Engineer, and constructed the northern batteries which effected breaches through which Seringapatam was successfully stormed on May 4th.

Johnson and Moncrieff brought up surveyed lines from various points of the west coast to Seringapatam with columns of the Bombay army.

After the capture of Seringapatam, Fraser, of the Engineers, made a survey of the island and its fortifications, whilst Thomas Sydenham, of the Guides, was deputed to survey the new south and east boundaries of Mysore, "but a violent illness obliged him to abandon this work" [194]. De Havilland, who was Engineer

[1]Mack MSS. LX (68 *et seq.*). [2]Letter to Alexander Johnston, 1-2-1817; H. H. Wilson (Introduction). [3]*Relations de divers Voyages Curieux.* Melchizedek Thevenot. Paris. 1664; frequently quoted by D'Anville & Rennell. [4]Beatson. [5]Sinha. [6]57 L/9. [7]MRIO. M. 83 & 166. [8]Afterwards the 1st Duke of Wellington.

with the column which took over the province of Coimbatore, "laid down a considerable part...as a voluntary act" though "not employed or paid as a surveyor[1]" [114].

Mackenzie was deputed to attend the Commission which sat at Seringapatam to settle the affairs of the newly constituted government[2], and prepared maps to assist in the determination of the boundaries[3]. He writes that,

> Few satisfactory materials could be there procured, and those of inferior merit, and disagreeing in their nature, and it appeared absolutely necessary to commence such a work from an entire new foundation, for...though the Central parts of the country had been repeatedly traversed by our armies in the Mysorean Wars, yet the limits and extent of the several Districts were not defined, nor were even any plans of the surveys...to be procured at this time, unless we except the results published so far back as 1792 by Major Rennell [111], and some manuscripts of detached parts in private hands[4].

This state of affairs, whereby the work of earlier surveyors was so often lost or hidden away and thus of no avail when sadly needed in later years, was of course the direct result of the refusal of the Directors to establish a special survey department and surveyor general at Fort St. George, in spite of the frequent requests of the Governor and his Council.

The story of the survey of Mysore by Mackenzie will be told in a later volume. The charge could not have fallen in better hands; by his thorough professional methods and his wise organisation of the work, he set a sure foundation and high standard for the future topographical surveys of India.

[1]Mackenzie's *View of the measures to be taken to Survey the Mysore Country.* BM. Addl. MSS. 13659 (240), 1–5–1800. [2]Beatson (221). [3]*v.* map facing Beatson (256); Mysore was now reduced to the limits which exist to this day. Coimbatore, Wynād, and Canara went to the Company, Bellary & Anantapur to the Nizām; in 1800 an agreement was settled by which the Nizām ceded the two latter districts, with Kurnool & Cuddapah to the Company in return for military support, and these became known as "The Ceded Districts" of Madras [pl. 1]. [4]DDn. 68 (21).

CHAPTER VIII

BOMBAY SURVEYS

City Surveys — Marātha Wars, 1774–82 — Marine Surveys — Charles Reynolds, 1783–90 — Emmit with the Marāthas, 1790–5 — Malabar, 1790–1800 — Reynolds & his Map, 1792–1800.

ALTHOUGH the Bombay Presidency holds the honour of possessing the first factory established by the East India Company in India, namely Surat, founded in 1612, yet it did not acquire any further territory, other than a few factories along the west coast and the islands of Bombay and Salsette, until the nineteenth century.

In 1661 Bombay Island came to Charles II of England on his marriage with the Infanta of Portugal, and was transferred to the East India Company in 1668. Salsette, though included in the dowry, was retained by the Portuguese, and captured from them by the Marāthas early in the 18th century, and first taken by the British in 1774.

Plans of Bombay illustrate books by the following authors[1]: Ovington, 1688, *Plan of the Citadel;*—Dr. Fryer, 1698[2], *Bombay Harbour and Island*, "so inaccurate that it is difficult to identify" those islands that are named;—Herr Niebuhr, 1764, a map of the Island;—and Mr. Grose, 1772[3], a skeleton *Plan of Bombay;* these two last may have been taken from the following maps by De Gloss and De Funck.

Orme records a *Plan of the Island of Bombay* by De Gloss dated 1755[4], and in the British Museum there is a *Plan of Bombay Town*, 1756, by De Funck, which shows the Fort and its immediate surroundings, scale about 100 feet to an inch; it is accompanied by an account of the survey and a forwarding letter addressed to the Governor and Council[5].

The British Museum also holds a Plan of Surat[6], in colours, scale 300 feet to an inch, by De Gloss, dated 1753[7]. Both De Gloss and De Funck were engineer officers of Bombay Artillery [266, 273].

The Gazetteer of Bombay City and Island, besides reproducing the maps from Fryer and Grose, includes a *Sketch of Bombay Harbour, 1626*, by Davies, and a map "prepared for the Peshwa" by his agent in Bombay about 1770[8].

In 1784 Reynolds was employed on a survey of Bombay and Salsette, and Malet[9], with whom he was to work for several years, writes,

> Capt. Reynolds, Surveyor to this Establishment, by the Governor's desire, who is ever desirous of promoting useful knowledge, has furnished me with the enclosed sketch of Bombay, its Harbor and Environs. ... This chart has been taken in a hurry from materials that have not yet the sanction of official authority, and consequently are only meant for your individual Information. Captain Reynolds hopes soon to be able to furnish an authentic chart of these parts[10].

In February 1785 he was relieved by Sartorius who was ordered to "proceed with the survey of Salsette[11]".

During 1794–5 William Brookes, of the Engineers, was employed on a survey of Bombay town for the "Committee of Buildings"[12].

[1]Douglas (145). [2]*A New account of East India...*1672–81, John Fryer (157), (Hakluyt Soc. 1909). [3]*A Voyage to the East Indies...*Grose (Bom. Civ.) (29). [4]Orme MSS. 65. This may be same as MS. map, *Imp. Lib. M & P.* 371; scale 3" to a mile. [5]BM. K. 115 (57). [6]Surat City captured from Mughal governor, 1759. [7]BM. K. 115 (56). [8]*Gaz. Bombay City*, I (32, 47, 48) & II (127). [9]Charles Warre Malet; Bom. Civ.; Writer 1769; Bart. 1791. [10]Letter to Orme, 10–1–85; Orme MSS. 331 (23). [11]Bo S & Pol. 1–2–85. [12]Bo PC. 23–5–94 & Bo MC. 7–7–95.

MARĀTHA WARS, 1774–82[1]

Bombay was closely surrounded by three Marātha powers; the Peshwa at Poona; the Gaeckwar of Baroda, and Sindhia; most of the surveys carried out in western India during the 18th century were of Marātha territories.

In 1772, to effect a settlement of debts owed to the Company, the Bombay Council took possession of the important town of Broach[2], which had belonged to the Emperor of Delhi. In December 1774, to forestall the Portuguese, they siezed Salsette Island[3] from the Marāthas, and the following year, in supporting a Marātha claimant Raghuba[4] against the ministry at Poona, a force under Colonel Keating invaded Gujarāt[5] with the assistance of troops from Madras.

Peace was settled by Colonel Upton's mission to Poona [30–1], and under the treaty of Purandhar[6] possession of Salsette and the smaller islands in Bombay Harbour was confirmed.

In 1778 war broke out again, once more in support of Raghuba, and the Marāthas re-occupied Salsette. General Goddard's force from Bengal arrived too late to prevent the disaster of Wadgaon[7], but in the campaigns which now followed Goddard not only recaptured Salsette, but occupied the northern Konkan[8] and a large part of Gujarāt, and also captured the port of Bassein[9].

The Supreme Government were by now, however, most anxious about the outcome of the war against Mysore, and came to terms with the Marāthas. Under the treaty of Sālbai, December 20th 1782, all these acquisitions were surrendered except those covered by the treaty of Purandhar; Broach was handed over to Sindhia.

Surveys of the Deccan were first made by the redoubtable Torriano, who in March 1777

accompanied the British ambassador to Poonah, in the command of his honorary guard, 2 companies of Sepoys; but with secret directions from the Select Committee at Bombay to take privately such surveys of the roads and views of the forts as could be effected without alarming the Mahratta Government, and, to more effectually accomplish this purpose, he travelled to Aurangabad and other cities in the peninsula of India[10].

Reynolds writes in the memoir of his map of 1787 [127],

The road from Poona to Aurangabad I have laid down from an actual survey made by Major Torriano, when he was at Poonah in the time of Mr. Mostyn's residency; it was communicated to me by a friend some years ago; the situation of the principal branches of the Beema[11] and Gunga Godowry[12] Rivers are particularly described in that plan, and become the more of consequence as they are corroborated by a late survey of my own[13]. ...

The route from Poonah by way of Jamgom[14] to Caarbarry in the Kandeish is laid down... from Mr. Charles Stewart's Journal when he was an Hostage with Mhadjee Scindia; the bearings were regularly taken with a Compas, the Distances are computed,

Stewart and Farmer of the civil service[15] were left as hostages with the Marāthas after the signing of the "Convention of Wadgaon" in January 1779, and Rennell writes of

the road from Poonah to Nursergur...and round to Soangur[16], which was described by Messrs. Farmer & Stewart, during the time they remained as hostages in the Mahratta camp. ...

Mr. Farmer, in his way from Poonah towards Naderbar[17], observed that the passes had all a descent northward, forming, as it were, a series of steps, until he landed in Candeish. He was then a hostage with Madajee Sindia, who at that time led the grand Mahratta army into Guzerat, against General Goddard[18].

The last stage of Goddard's famous march [4, 38–9], Burhānpur to Surat, a distance of 300 miles, was completed in 19 days[19], a dash by which he eluded

the force of 20,000 Marāthas sent to intercept him. The march was through a country then utterly unknown, and of which no maps existed[20].

[1] *Imp. Gaz. The Indian Empire*, II (442–3) gives 1st M. War 1775–6; 2nd, 1778–82; 3rd, 1803–04; 4th, 1817–8; other authorities count these first two as one: for an account of these wars see Cadell (84–99). [2] 46 C/14. [3] 47 A/16. [4] or Ragunath. [5] The central plain N. of Narbada R., and E. of Cutch and Kāthiāwār; 46 A, B, E, F. *Imp. Gaz. Bom.* I (200). [6] Hill fort 20 m. SE. of Poona; treaty, 1–3–76. [7] 20 m. NW. of Poona, 47 F/10; 13–1–79. [8] The strip of coast below the Ghāts, both N. & S. of Bombay. [9] 47 A/15; 11–12–79. [10] *EIMC.* II (117). [11] Bhima R., 47 F, J, O. [12] Godāvari R., 47 I, M, ... [13] Bo S & Pol. 8–1–88. [14] Jalgaon, 46 O/12. [15] William Samuel Farmer, Writer, 1763. [16] Songarh, 46 G/12. [17] Nandurbār, 46 K/3. [18] *Memoir*, 1793 (223, 258). [19] Feb. 6th to 25th, 1779. [20] Gleig (5).

This part of the route was surveyed by Duncan Stewart[1], who remained Surveyor to the detachment throughout its stay on the Bombay side. In a letter addressed to the Supreme Council in 1781, he advises the despatch of

a survey of the route of the Army commanded by General Goddard, from the Capture of Bassein till the close of the last campaign[2]. ... The survey of the March from Surat to Bassein I have not yet been able to accomplish in a manner sufficiently correct, having been indisposed during part of the time. ... The next season will, I hope, give me an opportunity of compleating it. ... In October last I transmitted...a survey of the movements made by the army in Guzerat during the preceeding Campaign, but I have not yet learned whether that, or my survey from Burhanpore to Surat, have been received[3].

To return to Reynolds's memoir;

The road from Callian[4] to Surat is from the survey made of Colonel Morgan's route by Lieut. Duncan Stewart, the Surveyor to that Detachment. ... The road from Surat to Ahmedabad[5] was surveyed by Mr. Duncan Stewart, as well as the Conkun from Bassein to the Bhor Gaut, when General Goddard marched through those Countries.

The Conkun was also surveyed by Capt. Jackson by order of this Government. I was also employed under General Goddard on those services, and tho' not the surveyor, I always kept the route of the army, etc., and upon a reference to the surveys of Captain Jackson and Mr. Stewart, I find mine does not agree with the scale of either, but as I have had opportunities since...of comparing my own original Plans, I have inserted them in my map in preference[6]. ...

The routes through the Broach Purgunnah were made when I was employed on that survey with Captain Turner; and the others to Dubhoy, Jamboosur, Cambay[7] and Ahmedabad ...were taken by me for my own private satisfaction as opportunity occurred, and when I was not employed in the surveying line[8].

After the capture of Broach, Charles Turner had been given charge of the engineering works there, and in 1775 the Council resolved that,

Survey of the Broach Purgunnah upon the Plan proposed by the Factors...will be attended with Infinite Benefit to the Revenue, and it must accordingly be carried into Execution; ... and...it will also be of use to have a geographical survey made at the same time of the Purgunnah; this business must be committed to Lieutenant Turner[9].

Other officers were appointed to assist, but the survey was still incomplete by April 1779, when Turner, being called upon to explain the delay, reported that,

At the time I accepted of the appointment of Surveyor, it was upon a supposition of being Principal, and that the assisting Surveyors were to have been under my immediate Direction; had that been the case, the work would have been much sooner compleated, but I was consulted only as to the mode of carrying the survey into execution: the several Gentlemen employed were independent of me & received their orders of the Chief as Collector General, and to him only they made their reports and delivered their Plans & Calculates. As I have not yet received an account of those Plans & Calculates, it is not possible for me to ascertain at present the true state of the Survey, but from the enquiries I have made here [Bombay], I find that much depends upon the assiduity of Messrs. Lindrum & Reynolds, who will require almost the remainder of this year to complete the work. ...

The officers...were recalled to the Presidency soon after the last rains, and from that time have been constantly doing Military Duty. ... On the return of the Army from the late service I applyed to go to Broach purposely to forward the survey, but could not obtain permission.

On this the Council resolved that,

As it is highly necessary it should be finished with all possible Expedition, several important arrangements being necessarily deferred for want of it, RESOLVED that Capt. Turner's Proposals be complied with, & that himself & Capt. Lendrum do immediately proceed to Broach, where they will be joined by Capt. James Jackson & Lieut. Reynolds, now to the Northward, who, with any other Officers properly qualified...must be put under the Orders of Capt. Turner[10] [4].

The Directors showed particular interest in this survey, writing in 1780,

[1]Map, MRIO. 118 (5). [2]Rough sketch of "the Konkan Campaign", 1781; MRIO. 118 (22); *v.* map of same period by Ens. Stokoe, covering march from Kalpi, Upton's march to Poona and campaigns in Gujarāt, MRIO. 31 (23–4); unsigned map, BM. Addl. MSS. 18109 (B). [3]BPC. 4–9–81. [4]Kalyān, 47 E/4. [5]46 A/12. [6]Bo S & Pol. 8–1–88. [7]Dabhoi, 46 F/8; Jambusar, 46 B/16; Cambay, 46 B/11. [8]Bo S & Pol. 9–1–88. [9]Bo PC. 3–10–75. [10]Bo PC. 23–4–79.

Not having yet received a report of the survey at Broach, which we have so long expected, we are not competent to give our final directions respecting the management of our affairs there[1].

The survey was completed by 1782, and the Council was able to send home to the Directors[2],

A Map of the Broach Purgannahs, and the march of the troops under Lt. Col. Keating in 1775, during the Guzerat Campaign[3].

The British Museum holds an undated "Sketch of the Goojerat by Hahfizee", a rough skeleton map distinguishing the areas belonging to the Peshwa, the Gaeckwar, and Scindhia, scale about 12 inches to a mile[4], and Rennell speaks highly of

a MS. map of Guzerat, ... which has the appearance of greater accuracy in the outline, and certainly contains more matter within it, than any other map of the tract; ... drawn by a native of Cambay, a Brahmin of uncommon genius and knowledge named Sadanund; ... given me by Sir Charles Malet...who first suggested the idea of drawing the map[5].

This genuine Hindoo map, contains much new matter; ... it gives the form of Guzerat with more accuracy than the European maps could boast of[6].

MARINE SURVEYS

Though it is not intended to give any connected account of the marine surveyors, reference must be made to the share they have taken in mapping the coasts of India; fuller particulars have been given by Markham and Low.

We have already referred to the early work and lifelong enthusiasm of Alexander Dalrymple, to the work of Ritchie and Topping in the Bay of Bengal and of Blair in the Andaman Islands, and now tell of the work along the western coasts.

The first knowledge came from the early navigators, Portuguese, Dutch, and English, and then the more reliable work of Après de Mannevillette. There is an undated French map, Cochin to Cranganore, decorated with ships sailing the sea, and houses and churches marking the town sites[7].

Of later work there were the astronomical longitudes of Howe and Huddart [176], a land survey by De Funck from Mt. Dilli[8] to Mahè, and another by D'Auvergne from Ponnani to Calicut[9].

The first surveying expedition sent out by the Bombay Marine was in 1772, when Blair and Mascall explored the coasts of Kāthiāwār, Sind, Makrān, and part of the coasts of Persia and Arabia[10]. In 1773 Skynner[11] surveyed the Broach river, the Gulf of Cambay, and the coast of Kāthiāwār, Dalrymple writing,

The Gulf of Cambay is taken from the MS. of Mr. Skynner's Survey; I attribute to the inattention of his Engraver the differences to be found in the *elegant Chart* published by that Gentleman[12].

Rennell also makes use of Skynner's charts for these coasts, but finds them disagree with charts by Ringrose, also of the Bombay Marine[13], whose work Reynolds uses for his map of 1787[14].

In 1786 an expedition was sent to take possession of the island of Diego Garcia, or Chagos[15], sailing from Bombay on March 15th, and proclaiming the island a British possession on May 4th[16].

A Senior Merchant was sent in charge, with Sartorius as Engineer, Surveyor, and in command of the military detachment. Blair of the Marine, and Emmit of Infantry, were sent as assistant surveyors, and had the *Drake* and *Viper*[17] for survey ships; Emmit carried out a survey of the main island, whilst Blair explored and mapped the surrounding islands and shoals.

[1] CD to Bo. 5–7–80. [2] Bo to CD. 10–2–84 (141). [3] Map subsequently engraved by Dalrymple [176 n. 14]; MRO. MS. Map 678. [4] BM. Addl. MSS. 13907 (e). [5] Malet was Resident at Cambay in 1775. [6] *Memoir*, 1793 (185–6*n*; 224). [7] MRIO. 133 (14). [8] 48 P/4. [9] List of Charts, Dalrymple (xx); *Memoir*, 1793 (22–3). [10] Low (186). [11] W. Augustus Skynner, Bom. Mar. [12] *Collection of Plans of Ports*...Dalrymple, 1774–5; 3rd ed. 1787 & *Memoir of a Chart of the Coasts of Guzurat & Scindy* Dalrymple; 3–9–83. [13] *Memoir* 1783, (27); 1793, (33–5). [14] Bo S & Pol. 8–1–88. [15] 7° 16′ S; 71° E. [16] Bo F & P. 16–1–86, *et seq.* [17] *Viper* accompanied Blair to Andamans [47, 48].

On May 7th Blair was "instructed...to set out next morning on a survey of the Harbour", being allowed only 16 days;

For facilitating the more particular survey of the Island afterwards, he was to leave a distinguishing mark on all the principal points, which should terminate his angles, or form stations, to enable those points to be found at any future time. ...

Received great assistance...from Lieutenant Wales [49 n.7], ... otherwise should not have been able to compleat it in double the time. ... On July 3rd sailed with Experiment and Viper to examine the outward coast of the Island[1].

The expedition was withdrawn on receipts of orders from Bengal dated August 22nd, and the Directors afterwards expressed great surprise at its magnitude and unnecessary cost[2]. Blair was left to continue his survey, and "November 8th proceeded on a Survey of the Adjacent Islands, continuing till January 29th 1787". On his passage back to Bombay he made observations of the positions of Minicoi and the Laccadive Islands[3].

The Directors meanwhile had issued instructions for a regular survey of the coasts by officers of the marine service, and had sent out a set of instruments;

It is our intention that these Chronometers and Instruments be always on board the same vessel [203]. ... We direct that a Supernumerary Lieutenant do always proceed with the Chronometers, under whose especial charge they are to be, and we recommend that Lieutenant John McCluer be employed as the Supernumerary Lieutenant for making the observations. ...

We would have the vessel proceed along the coast from Bombay to Surat, determining carefully the Latitudes and Longitudes of the various points, as well as of the Peaks and Hills inland, with explanatory views of the Lands, taking Altitudes for determining the time by Chronometer every hour, and taking the bearings and altitudes of the lands &c. by the Hadley at such time.

Instructions then followed for carrying the survey round the coast of Kāthiāwār;

Let what is done be done compleatly and nothing left undetermined in this space; if any doubt arises let them repeat their observations in such part, that an implicit confidence may be safely placed in their work when finished.

When this work is finished, we direct that a particular examination be made of the Lakadive Islands and the various banks between them and the Coast of Malabar. ... In the course of this Voyage it will be proper to determine the relative position of the Lakadives, Malicoy, ... and the Head of the Maldives[4].

In another letter they write;

The facility which the use of Timekeepers and Lunar Observations give to Surveys, sufficiently accurate for the safety of navigation, will we trust enable you to get this important service completed with expedition. We rely upon your selecting Persons of every rank in our Marine best qualified for this employment, and that you will inform them that proofs of activity and Science in their profession will entitle them to our particular notice and encouragement[5].

On November 15th 1787, "the Season being now sufficiently open for prosecuting that object", McCluer sailed in the *Experiment*, and carried on survey till the following April when monsoon conditions drove him into Surat in distress. On the 11th, ... it blowing a fresh gale from the S.W.ward, we were necessitated to leave the Guzurat shore, it being void of any shelter from these winds, even for so small a vessel. In coming across the banks at the entrance of the gulph, the seas ran so high that we swamped our large boat, and several of them broke upon us. ... On the afternoon of the 15th, being half-tide, weighed to go into the river, but our stupid fellow of a Pilot ran us on the W'ern Bank, where with a few heavy strokes we unshipped our rudder; then came broadside to the sea, which broke over us, and in this disabled condition we lay beating very hard, ... and as the Vessel is so very slightly built, I expected every stroke to be our finishing one; however by God's providence and the exertion of our People at the oars, got her again before the wind and the sea, and with them conducted her up the river. ...

We have been four days wind-bound in the River, it blowing fresh the So'ward, and are now safe over the Bar again, intending to go once more so far as Diu, then traverse down to Bombay the whole extent of soundings, if the Vessel will stand the weather[6].

[1] Blair's Journal, Dalrymple. [2] CD to Bo. (S & Pol.) 23–3–87. [3] Bo F & P. 27–11–86. [4] CD to Bo. 8–3–86 (20–2, 26–7). [5] CD to Bo. 23–3–87. [6] Letter of 29–4–88, Bo PC. 92 A (319–20).

In September McCluer reports

that I have...surveyed the Coast of India from the Ltd. 17° 12′ N. to 21° 40′ N. including the Gulph of Cambay, and on the Guzarat shore to Diu head, with the soundings 40 leagues from the Coast. ... By what I can learn from Mr. Dalrymple's Letters, the Surveys are to be carried on *So. ward*, and among the Islands; if such is the case, for the greater perfection of the work and safety of those employed, it will be expedient to have a larger Vessel than the one I now command, which is very little larger than a long boat, and of a force sufficient to protect herself...from insult, that may be given by the freebooters on the Coast[1].

McCluer continued his surveys southwards to Cape Comorin till 1790, and Rennell records that

an extent of about 360 miles, out of 570, between Zyghur[2] and Anjenga, has been explored; ... the remaining parts were left unexamined because of the then state of hostility with Tippoo. Part of this defect is supplied, between Merjee and Cundapoor, by Capt. Reynolds's survey in 1781[3].

CHARLES REYNOLDS, 1783–90

So long as the war against the Marāthas dragged on, Bombay could send but little aid to Madras in her struggle against Haidar Ali. In April 1781 a small force under Major Abington had been sent down for the defence of Tellicherry[4], and during February 1782 had captured Mahè from the French, and Calicut from Mysore; before the end of the month he was joined by Colonel Humberstone [98 n. 13] who landed with about 1000 British infantry, and took over command[5].

During April Humberstone marched south, intending to reach Palghāt, but after defeating the Mysore forces at Tricalore[6] he had to shelter from the monsoon at Tanūr. In the following October he marched to the walls of Palghāt, but had to retreat in haste, being however successful in drawing Tipu and his main forces away from the Carnatic. We have already noticed the surveys made of his marches by James D'Auvergne [99, 123].

After the treaty of Sālbai in December 1782 a strong force under General Mathews captured Mangalore and Onore[7] on the coast of Kanara, and marched up to Bednur, a small district above the Ghāts which commanded the north-west approaches into Mysore[8].

Reynolds accompanied the army and, being employed in surveying, escaped being taken prisoner when Mathews and his army were overhelmed at Hydernagar[9] in April 1783. He was however shut up in Onore which was gallantly defended by Torriano until peace was signed in March 1784[10].

On return to Bombay he handed in his survey

of part of the Bedanure Province, taken by me on the late service as Surveyor General to the Army; it contains all the principal Gauts that are within that space, and the whole from actual survey[11].

The survey appears to have covered a good deal more than the small district of Bednur, for Rennell took

the coast between Barcelore[12] and Meerzaw...from a recent map by Captain Reynolds, during the war which terminated so unfortunately for the British arms in 1783, in the Bednore country, to which this part of the coast is opposite.

This map is drawn in a most masterly style and contains near 60 geographical miles of the coast, and extends inland to the foot of the Ghauts, which here approach, in some places, within 6 miles of the sea. ... It includes the positions of Bednore, and Bilghey[13], within the Ghauts, and also Onore...on the coast[14].

[1] Bo PC. 18–9–88. [2] Jaigarh, 17 G/3. [3] Mirjan, 48 J/6, Coondapoor, 48 K/10; an obvious error for 1783 when Reynolds made his survey of Bednur [*sup*]; *Peninsula* (2). [4] 49 M/10; Company's factory, founded 1683. [5] Cadell (97–100). [6] Trikkalum, 17 m. SE. of Calicut, near "Tippu's Fort", 49 M/16. [7] Honāvar, 48 J/7. [8] Western part of Shimoga Dist. Mysore, 48 J/16 & N/4, K/13, O/1. [9] The capital of Bednur, now a small village called Nagar, 48 O/1; *Imp. Gaz. Mysore* (253). [10] Description of siege, Forbes (107 *et seq*). [11] Bo S & Pol. 24–12–84. [12] or Bhatkal, 48 K/9. [13] Bilgi, 48 J/15. [14] *Memoir* 1793 (28).

After a few months spent on a survey of Bombay Island [120], Reynolds was ordered to accompany Malet who had been deputed by the Governor General to visit Sindhia[1], and then proceed to Calcutta to discuss policy before taking up the appointment of Resident at the Peshwa's court at Poona [6]. The Bombay Council write to Malet,

As it is our fixed intention to embrace every proper opportunity of procuring a knowledge of the interior parts of Hindoostan, We have directed Captain Reynolds our Surveyor to accompany you. ... Captain Reynolds will be directed to obey such directions as he may receive from you during his absence from hence, to embrace every proffered opportunity of making observations upon the Countries he passes through, at the same time taking every possible precaution to give no alarm or jealously to the people, where it can be by any means avoided[2].

The mission started from Surat on March 12th 1785, and travelled "through country alive with Bhils". The camp was robbed, and Cruso, the surgeon, lost a set of valuable surgical instruments; passing through Ujjain [56 n. 10] they reached Gwalior on May 2nd, and Sindhia's camp near Muttra on the 23rd[3]. The following extracts from letters by the way give an idea of the interest taken in this journey.

I have the honour to acquaint you of our arrival at Broda[4]. We left Surat on the 12th and arrived here by the way of Broach on the 22nd. ... We move from hence tomorrow; our route leads by the way of Champanior[5], through a Country totally unkown to Europeans as far as Ugen, and will afford me an opportunity to furnish information that has never yet been in the power of any other Geographer[6]. ...

The 26th I arrived at Hallole[7] the first place subject to Madju Scindia since leaving the Broach Purgannah. The Country is beautiful, richly wooded, and intersected by numerous Gullies and rivulets, some of which at this advanced season have water. ... Champanier is situated at the bottom of the vast Mountain of Powaghur[8], which with very little assistance from art forms an almost impregnable Fortress. ... This place, notwithstanding it appears so totally inaccessible, was taken by surprize by Humayun[9] from Sultan Bahadur, King of Guzerat. Captain Reynolds is employed in taking a view of this famous and extraordinary mountain[10]. ...

We arrived here [Ugein] on the 10th instant, & in the course of the route have gathered information respecting the country...that is much wanted in Reynell's Geography, and of every other that I have yet met with. The country is in general laid down from Champanur as belonging totally to Holcar and Scindia; on the contrary, the whole of it, from about 50 miles on this side of Brodera, till within 60 or 70 of this place, is in the hands of distinct Grasiah Rajahs or Zemindars, the Capitals of most of which I have been able to ascertain with tolerable accuracy, and in this last 60 or 70 miles of our route, the country is partly divided between Scindia, Holcar, and the Power Family of Marattas, whose Capital, Dhar[11], I have also been able to fix with respect to situation. I find Indoor[12] as well as Dhar to be exceedingly misplaced in Rennell, and even this place as laid down by him does not correspond with my observations, which, from experience of my Instruments, I can venture to say are perfectly correct [177]. I have been able to determine the source of the Mhye[13], which takes a totally different direction from that given it by any other Geographer. Thus far our route will throw a deal of light on the situation of this part of Hindoostan. ... We march tomorrow and shall proceed on a different route from any yet travelled by Europeans, till we reach Kallaness[14] when we shall fall into the road laid down in Rennell's Map[15]. ...

I shall proceed tomorrow morning by the route of Ragogur Hill[16], wishing to avoid the Common road from motives already mentioned of extending our Geographical knowledge, which, from what I have already observed, I have reason to think will receive great elucidation from the accuracy of Captain Reynolds's survey.

I have taken the liberty to enclose you a table of my journey hitherto, in which I hope you will excuse any want of Precision and method, since my confidence in Captain Reynolds's well known skill and ability has made me less sollicitous on those points[17]. ...

My last respects were under the 13th ultimo from Ugen. ... I have now the honor to enclose a continuation of it from thence to Gwalior, where I arrived the 2nd instant, having been

[1]Mahadji Rao Sindhia of Gwalior. [2]Bo S & Pol. 18–1–85. [3]Forbes, III & IV, Cruso's narrative of journey. [4]Baroda, 46 F/3. [5]Chāmpāner, 46 F/7. [6]From Reynolds, Bo S & Pol. 3–4–85. [7]Kālol, 46 F/6. [8]Pāvāgarh, 2,719 ft. 46 F/6. [9]Mughal Emperor, Father of Akbar. [10]From Malet, ib. 9–4–85. [11]46 N/6. [12]Indore, 46 N/14. [13]Mahi R. 46 I, E, F. [14]Kolāras, 54 G/12. [15]From Reynolds, ib. 29–4–85 [16]Rāghugarh, 54 H/3. [17]From Malet, ib. 1–5–85.

forced to halt two days for the refreshment of our people and cattle, after our late brisk marching at this very warm season; shall proceed tomorrow and to be at Akbarabad[1] the 13th instant[2].

Rennell received this route in time for incorporation in the 1792 edition of his map [214], and records that,

This survey of Captain Reynolds's came to hand long after the construction of the Map of Hindoostan, 1788. ... Captain Reynolds's route must be regarded as a very capital one; being through a tract which was heretofore the most vacant part of the map; and of which our general knowledge was so limited that we supposed the courses of its rivers to be to the south and into the Nerbuddah, when in fact they were to the north and into the Jumna River[3].

The mission reached Sindhia's camp near Muttra on May 23rd, and after calling on the Emperor at Delhi left Agra for Cawnpore, where on August 10th they embarked in budgerows for their journey down the river, reaching Calcutta on October 18th. From Calcutta they returned to Bombay by sea.

At the desire of the Governor General, Reynolds was now deputed to accompany Malet to Poona, so

that our knowledge of the interior parts of this country may be increased by the future exertion of his useful Talents[4].

They left Bombay in February 1786, and passing through Poona made

a journey to the Marātha Army when besieging Buddamee[5] about 250 miles from this city, ... that will tend greatly to elucidate many points which Major Rennell, from want of authentic materials, has not been able to ascertain[6].

After a week's halt they accompanied the Peshwa back to Poona. Reynolds kept a survey of the route the whole way, through a country that had only been known hitherto by the travels of Mandelslo[7] from Goa to Bijāpur [176], and of Anquetil-Duperron

whose travels from Goa to Poonah [writes Rennell] furnished some useful matter towards filling up a part that has long remained almost a perfect void [28], ... but a great part of it is now superseded by the survey of Capt. Reynolds[8].

Obtaining permission to return to Surat for the recovery of his health, Reynolds surveyed one route down to Surat, and returned to Poona by another early in 1787. He returned again to Surat for the rains, and at the end of the year submitted to Government a "corrected Plan of Hindoostan...on a very large scale", covering an area from 12° to 29° N, and from 71° to 80° E; he attached a full account of all his sources of information, and gave his reasons for improving on the details of Rennell's *Map of Hindoostan*;

I have accompanied my map with a copy from Major Rennell's on the same scale. It will point out more readily the total change these surveys of mine give to the Geographical system of Hindoostan. The rivers in the Province of Malwa that run under Uggein, etc, have always been supposed to be branches of the Nurbudda River; my surveys determine that they are all Tributaries to the Chumbul[9] and ultimately to the Ganges. I hope I shall not be considered as endeavouring to depreciate Major Rennell's performance by contrasting it with mine. I preferred his as being the best extant.

He took every care that his surveys should not attract the attention of the Marātha officials;

I also request that your Honors will be please to point out to them [the Directors] the inconvenience that may occur from allowing them to be published, or in any way made public; the Ministers at Poonah would probably get the information, and in that case the loss of my liberty and perhaps more serious consequences to me may ensue from it and by the loss of my papers etc., defeat the intention of employing me[10] [297].

In April 1788 Malet arranged through George Forster, now Resident at Nāgpur, to get passports for Reynolds to travel through the territories of the Bhonsla Rāja[11], and suggested that he might make a journey right through to Masulipatam,

[1] Fatehpur Sīkri, 54 E/12. [2] From Malet, ib. 3–6–85. [3] *Memoir*, 1793 (320). cf. Markham (58), which does but scant justice to the value of Reynolds' surveys. [4] Bo to CD. 13–1–86 (9). [5] Bādāmi, 48 M/9 in Bijāpur Dist. where the Peshwa was then at war with Tipu; Grant Duff, III (1–12). [6] From Malet to Warren Hastings, 14–2–87; BM. Addl. MSS. 29216. [7] *Memoir*, 1793 (258) refers to map of Mandelslo's routes by Father Du Val. [8] ib. (252). [9] Chambal R. 46 M to 54 J. [10] Bo S & Pol. 8–1–88. [11] Also called Rāja of Berār, or Nāgpur.

which he succeeded in doing by way of Hyderābād in November, travelling on through Guntūr to Fort St. George, and shewing his survey to Sir Archibald Campbell[1] [101 n.9].

From Madras he travelled back to Hyderābād, and from there followed a new route to Surat by way of Aurangābād, the necessary passports being obtained on the grounds that the state of his health prevented a journey through Poona. Malet reports this as giving

a new opportunity to Captain Reynolds' investigations without much cause of additional jealousy, which is less active while the object is at a distance[2].

In acknowledging the passports Reynolds writes,

My return to Surat, while it is favourable to my completing my map of that Quarter, which will take me some time, will also be attended with less difficulty to any further excursion than if I was to return to Poona. ... It will require at least one other Trip from Surat to Hyderabad after the rains to complete the Map of the Dukun. ... There will be no difficulty in procuring Purwanas[3] from this Government, and I trust you will find none in obtaining permission...from the Minister at Poona. ...

Since my leaving Poona, I have collected a very considerable stock of materials independent of my Survey, sufficient to determine the practicability of my perfecting a General Survey of India; but as it is impossible that I can arrange them during my travelling, I can in fact only now be considered as laying the foundation for the future structure[4].

and later,

My route from hence [Chimbly, 55 miles S. E. of Poona] will be by Simgumnere, Chandore, Salere, Moolere, Soanghur[5], and Surat, where I can hardly expect to arrive much before the setting in of the rains; ... The variety of materials from whence I draw my information are such that...the arranging of them is utterly impracticable while I am on my journey, where every moment of my time is taken up in collecting them. I shall therefore employ myself till the opening of the season of them, and in the vicinity of Surat. I have also an idea, if time permits, of making a trip to Cambay for some matters relative to the Geography of the parts of Goojerat to the westward of it.

You know very well the Ardour with which I pursue the object of my employment, and I make no doubt that you will do justice to it. ... I must beg...that you will forward my request that my assistant Lieut. Emmitt may be ordered to Surat to join me, for whom as well as myself I have enough to do[6] [273].

In October the Governor General gave orders that Reynolds's proposed trip to Hyderābād should be cancelled, for fear of its arousing resentment, and he was directed to remain at Surat and continue the arrangement of material already collected [6]. In April 1790 he accompanied the Bombay detachment that proceeded to Malabar to take part in the war against Tipu of Mysore [130].

EMMITT WITH THE MARĀTHAS, 1790–5

On the outbreak of the Third Mysore War in 1790, the Governor General having secured the co-operation of the Nizām and the Marāthas, a small detachment of Bombay troops, two battalions of sepoys and a few guns under Captain Little, was deputed to stiffen up the Marātha army which was marching south from Poona.

The detachment joined the Marātha army in May 1790 and reached Dhārwār[7] at the end of October, where it met with stubborn resistance; as there was no equipment for conducting a major siege, operations were held up to await reinforcements from Bombay. These landed at Cardona on the Jaigarh[8] River on November 25th under the command of Colonel Frederick, with Sartorius as second in command, John Johnson as Engineer and Emmitt as Surveyor. Emmitt observed a latitude at the mouth of the Jaigarh River, and ran a traverse to Dhārwār, with occasional latitudes [177][9]. The siege of Dhārwār Fort occupied several months, Sartorius succeeding to the command on Frederick's death in March 1791. After its fall, Emmitt was appointed surveyor to Little's detachment which

[1] ib. 19–1–89. [2] ib. 9–1–89. [3] Letters of authority, or passports. [4] From Reynolds, 26–1–89. [5] Sangamner, 47 I/2; Chandor, 46 L/3; Malhar, 46 L/2; Songarh, 46 G/12. [6] Bo S & Pol. 3–4–89. [7] 48 M/3. [8] 47 G/3. [9] Emmitt's report, Bo S & Pol. 23–11–92.

he accompanied southwards to Mysore, whilst Johnson, who had acted as assistant whilst on the march, was appointed surveyor to the rest of force, which marched back by way of Poona and reached Bombay on June 2nd[1]. The Marātha army now made forced marches and joined Lord Cornwallis 20 miles north of Seringapatam on May 28th, Emmitt completing his surveyed line to make junction with Colebrooke's survey from Madras [112–3]. He continued his line to Bangalore and Sira[2], and in October started a survey from Harihar[3] eastward down the Tungabhadra to its junction with the Kistna, then on to Pāngal[4] in the Nizām's Dominions, and from thence westwards through Bādāmi and Dhārwār to Goa. As the position of Goa had long been fixed by the Portuguese Jesuits, and more recent values of its longitude obtained by Huddart [176], this junction gave Emmitt a value for his longitudes [177].

Emmitt was the first English surveyor to visit Goa by land: D'Anville had taken its geography from a

particular map I had from Portugal; but I must own, that the scale of that map not being exactly known to me, I am afraid I have given the continent in this map rather too much extent[5].

Rennell also notes that on his map,

The environs of Goa and the country to the foot of the Gauts are from a Portuguese MS.; It is from Goa only, if from any quarter, that we are to expect the geography of the tract between Gauts...and Adoni, and which yet remains almost a perfect void in the map[6].

Many references to Emmitt and his survey are given by Moor in his *Narrative of the operations of Captain Little's Detachment*;

In the beginning of March (1792) Lieut. Emmitt...arrived here [Harihar] from his surveys. When he left Hurryhal, he proceeded along the Toombudra's banks to its junction with the Kristna; visited the famous city of Annagoondy[7]; went to Paungul, the residence of the Nizam and his court, and thence to Goa; from which place by the route of Dharwar, he was now arrived.

We shall here take occasion to mention the great acquisition our geographical knowledge of the peninsula will have met with from the labours of this gentleman; his surveys comprehend the greater part of the country in which the scene of this narrative lies, and...the lovers of science will be pleased to hear that the indefatigable exertions of Mr. Emmitt have produced accurate surveys of a great portion of that part of the peninsula, which exhibits so melancholy a blank in the map of our eminent geographer, Major Rennell.

Mr. Emmitt's surveys...comprehend considerably more than 2000 miles of distance; ... a number of desirable points and stations will be determined...; his route commences at Jaigur, where Captain Little's & Colonel Frederick's detachments left the sea, and continues in this order; to Darwar, Seringapatam, Bangalore, Sera, and the route just mentioned[8]. ...

After...March 22nd, Mr. Emmitt proceeded to the source of the Toombudra, and returned to Bombay by way Simoga[9]...Darwar...Bejapoor[10], and Poona.

Lt. Emmitt being desirous to proceed to the army, Lt. R. and the writer of this narrative determined to accompany him. ... As completing the survey of the Toombudra was a desideratum in Geography, we resolved on taking the route of Hooly Honore[11] and Simoga, ... by which means another road to Seringapatam would be surveyed, and we should avoid approaching too near the garrison of Chittledroog[12], and some of other forts in Tippoo's hands. ... [News arrived] of the glorious successes before Seringapatam of the 6th of February, and the cessation of hostilities. ...

We agree to leave Hurry Hal on the 23rd of March, with 45...sepoys and 5 Europeans, to join Captain Little's detachment at Seringapatam. It was of course necessary to proceed with all care and circumspection, having a journey to perform of nearly 200 miles, through a country, which although the greater part conquered, remained in a very unsettled state, and had many forts in the hands of the enemy. ...

Left Hurry Hal the 23rd of March: ... on 27th...halted at Hooly Honore. ... About midnight we were alarmed by a cry of thieves, and repairing to the place whence it proceeded, we found Mr. Emmitt's tent robbed of several trunks, and among them that which contained all his surveys, instruments and papers; this would have been an irreparable loss, but fortunately, not being carried far, it was found near the road. ... Had the robbers succeeded in carrying

[1]Survey of route, MRIO. 118 (12). [2]57 C/14. [3]48 N/14. [4]56 L/3. [5]Herbert (41). [6]*Memoir*, 1793 (292). [7]Bijayanagar, 57 E/1. [8]Moor (180). [9]Shimoga, 48 O/9. [10]Bijapur, 47 P/9. [11]Hounāli, 48 N/12. [12]Chitaldroog, 57 B/8.

off Mr. Emmitt's trunk of papers, it would have been a very distressing circumstance; for although he had sent copies of almost all his surveys to Poona, there were many valuable geographical materials, drawings, etc., that would have been a serious loss; until lately he had always slept upon that trunk, but supposing no danger of thieves amongst so many sepoys, and not being in perfect health, had omitted it; from this time however, he recommenced the custom, and never, while in the field, left it off[1].

After being joined by Johnson on March 26th,

We left Hooly Honore on the 29th, and crossed the Budra; ... marched past Simoga Fort. ... April 15th March from Hoosdroog[2]. ... Harrassed by enemy; ... Messrs Emmitt & R. both lost some part of their baggage. For our part, having been so recently stripped, we had but little to lose; that little however was lost; but nothing of any consequence, save for the stock of grain for our domestics and cattle, which could not be replaced in camp but at enormous expence. Our tents, bullocks, and such things did not much signify; ... Mr. Emmitt's horse was killed under him, which, and a Maharatta or two wounded, were the only accidents received from the enemy's musquetry. ... Joined up with the Bhow's army that evening[3].

Describes the falls into the "Gutpurba River", a mile west of "Gocauk", where the "Heron Cassey River" falls in a cataract[4].

Mr. Emmitt, with his usual industry and accuracy, made drawings of the cataract, from above and below. The breadth of the river was carefully measured, and the space through which the water falls ascertained by dropping a plummet from the top, to the water in the bason. ... May 12th we crossed the Gotpurba[5].

After his return to Poona Emmit completed his map, compiling all his surveys with the aid of astronomical observations, both his own and others taken by surveyors working under Kyd in Mysore[6] [112–3].

In November 1792 Emmitt was ordered with Johnson to Malabar to survey the frontiers of that province [131], but by the end of 1794 he had returned to Poona, to work under the instructions of Malet who was still Resident there [299]. He was nominally on sick leave from Malabar, but was allowed to accompany the Resident and the Marātha Army during the campaign against the Nizām which resulted in the defeat of the Nizām's troops at Kharda[7] [116]. In December he was granted sick leave to Europe.

MALABAR, 1790–1800

The immediate cause of the Third Mysore War in 1790 [112–3] was Tipu's invasion of Travancore, to oppose which a Bombay force under Lt. Colonel Hartley was sent down to the west coast in April, and successfully advanced to Palghāt in October.

The main Bombay army followed in December under the command of the Governor, General Abercromby, landed at Tellicherry, captured Cannanore and, driving all Tipu's forces out of Malabar, reached the borders of Mysore in May 1791[8]. Reynolds had accompanied Hartley's detachment in the capacity of A.D.Q.M.G., and appears to have been mostly employed upon surveys, sometimes assisted by Blachford of the Engineers. He writes,

Almost immediately after our arrival at Farokabad[9], at the top of the Ghauts, in 1791, I was detached by Colonel Hartley to examine a part of the Malabar Coast, and immediately on my return, I was again detached by Sir Robert Abercromby's orders to explore the Tambucherry Pass [131 n.8], and to ascertain whether his army could penetrate that way to Seringputtam[10].

We find records of a "survey of Cochin", a "survey between the Hills about Paulghautcherry", a "survey of the Malabar Coast & Calicut Country, and a Map of Malabar showing the limits of Koorga", all made by Reynolds during this period[11] [179].

[1]Moor (204). [2]Hosdurga, 57 C/5. [3]Moor. (221). [4]Gersoppa Falls, 48 J/12; height 825 ft. [5]ib. (264). [6]Bo S & Pol. 23–11–92; Maps, MRIO. 124 (24); 135 (2), 149 (5, 26–8). [7]47 N/6. HMS. 560 (386) & Bo MC. 8–12–95; Map, MRIO. 124 (17). [8]For accounts of these operations see Cadell (118–20), & Taylor (356–412). [9]49 M/16. [10]Bo MC. 25–11–94. [11]Maps, MRIO. 135 (45), 150 (7).

Under the treaty of Seringapatam [113] Malabar was ceded to the Company, and was administered from Bombay for the next twelve years. It is recorded that Captain Reynolds had made a sketch of the whole the Countries that had been ceded to the Allies respectively, excepting the District of Soondoon[1], which belonged to the portion that fell to the Mahrattas, but of the extent and position of which it had not been in his power to obtain accurate information[2].

Reynolds had, however, moved up to Mysore early in 1792, and in November the Governor describes the various defence works and surveys necessary for the security of Malabar;

For these purposes as well as to effect a general survey of the frontiers of the ceded country, I have to propose that Major Sartorius may be ordered down the Coast on duty. ...

It is unnecessary for me to point out the advantages that will result from a complete survey of the Frontiers; I have already ordered Lieutenants Emmit and Johnston to proceed to the Coast for that purpose, and have to propose they may be employed under the inspection of Major Sartorius[3].

Johnson had already during the course of the war made a survey of the route of the Bombay army "from Nujul Ghaut to Seringapatam", and in January 1792 from "the Ercoor River[4] to Seringapatam". Some of his letters whilst on survey in south Malabar have been preserved; in March 1793 "having surveyed the west end of the Paulghaut Range...south of the Munnar Pass", he has had difficulties with guides; his fever has been relieved by bark[5], and he asks that

you will request of General Abercromby to order bark enough to last me until the Survey be over. ... I have laboured under great difficulties for want of people to shew me the Boundary. ... I am going to the Mallicocote District...to survey the Munnar Pass[6].

Again, after describing the extent of the area over which the revenues had been collected by the emissaries of Tipu,

I deemed it best to proceed and survey the Boundary towards Tippoo's Country of the Upper Todenear District; ... I am now arrived in the District of Nombhully cote[7]. ... The District lies about 7 miles to the norward, or within the opening laid down in Captain Rennell's [obviously *Reynolds*] survey between the Munnar Ghaut and the Tembercherry[8] Range of Hills. ... I wish to be informed whether I am to return and survey the Western boundary of the three districts of Mahanaar, Poringai, and Nombhullycote...or whether I am to proceed to survey the Wynaat[9] District (which must now be very near us)[10].

Moncrieff and Woodington assisted Emmitt in his survey of "the Northern Superintendency" which included Coorg, Wynād, and "Mount Della with the Coast as far as Nelisuram[11]". Their survey was not entirely without incident, for the political officer received a report in July 1793;

The Coorga Rajah says that the Engineer came to examine the Boundaries and settle differences; that Tippoo's fellows came to surround him; that the Engineer told them that he was an English Sirdar come to inspect the Boundaries, and do justice on both sides. This they would not listen to, but abused him and fired at him[12].

In 1805 the Resident in Mysore records that a survey of the Coorg-Mysore boundary was made about 1792, "two Gentlemen having been deputed by the then Supreme authority in Malabar to effect that object"; he refers to it as authoritative, *if it can be obtained*[13].

In December 1794, Sartorius sent the completed maps up to Bombay under Emmitt's charge[14];

I have now the honor of transmitting the Maps of the Northern and Southern districts of the Malabar Province; ... both Surveyors, Messrs. Emmit and Johnson have endeavoured to render them as perfect in every respect as unremitted application could make these surveys. With regard to the few observable spaces which have yet not been explored, I have every reason to think they will not take much more than one season to survey, after which such public roads as may be deemed conducive to promote trade, and procure the speediest movement of our troops from one end of the Province to the other, may easily be traced out.

[1]Sonda, 48 J/14. [2]HMS. 615 B to CD. 5–4–92. [3]Bo MC. 23–11–92. [4]Valarpattanam R., north of Cannanore, from Irikur, 49 M/9. [5]Quinine. [6]Bo Sur.; Vol. 18, 23–3–93. [7]Nambalakōd, part of Gudalur *taluk*, 58 A/10. [8]Tāmarasēri, 58 A/3. [9]Wynād, 49 M/13, 58 A/NW. [10]ib. 11–4–93. [11]Map MRIO. 135 (46) & 144 (37), Scale 2 m. to 1 inch; Mount Dilli, 48 P/4; Nileswaram, 48 P/3. [11]HMS. 613 (81); Malabar Corr., 8–7–93. [13]DDn. 68 (338), 18–1–1805. [14]Bo MC. 20–1–95.

In October 1795 Moncrieff was appointed in Emmitt's place, and employed on a more thorough survey of the southern province for the Civil Commissioners, which was, however, broken off for other duties;

Captain Moncrieff was then employed under us in carrying on a survey, which we had proposed should extend throughout the whole province on a plan that will materially aid the ascertainment of the Revenue Funds, and otherwise prove of great public utility should it ever be completed. Captain Moncrieff, previous to his quitting us, did, however, finish a survey of the Betulnad District[1].

His work was commended to the Directors;

A great addition has been made to our knowledge of the Geography of Malabar since the map of the Ceded Countries prepared by Major Sartorius; for the elucidation of the First Commissioner's General Report we called upon Captain Moncrieffe, who had been employed to survey the Southern Districts for as complete a Map as possible[2].

After the final defeat of Tipu, Moncrieff, with the assistance of Williams, one of his subalterns in the Pioneers, was employed in North Malabar and Kanara, some of the work taking place during military operations against the Pychy Rāja of Kottayam[3].

Mountford[4] writes of one of their maps 25 years later;

I consider it to be little more than a sketch made during troublesome times, and therefore capable of very great improvement. In fact when compared with the surveys executed under this office it exhibits little more than a blank, as may be seen by the enclosed copies of the same tract of country from that map[5].

REYNOLDS & HIS MAP, 1792 TO 1800

On his return journey from Mysore in 1792 [116], Reynolds was able to fulfil the wish, that had been denied to him three years earlier, to carry another line of survey through the Deccan; this he did through Hyderābād, Aurangābād, and Kotah, to Agra[6]. From Agra he obtained permission to go down to Calcutta, where he pressed a scheme which he had long cherished, that he should be given authority, and means, to work up his own great map [217].

In pursuit of this purpose he obtained Blunt's services as assistant, and a grant of Rs. 800 a month for an escort, and during the cold weather of 1793–4 he and Blunt ran surveys from Allahābād to Pānīpat, and back to Lucknow [55]. Reynolds was then recalled to Bombay to attend a courtmartial, and on its conclusion returned to Surat, and once more took up the compilation of his map, and the collection of material. It does not appear that he made any further expeditions himself [218], but he employed a number of native surveyors, trained by himself, whom he sent out in all directions to measure new routes and fill in blanks. Their most valuable work was carried out in Gujarāt, Cutch, Sind, Rājputāna, and the Punjab [219].

[1] Vettatnād, a former *taluk* in north Ponnani, 58 B/1. Logan (527, 665–6); From the Malabar Commissioners, Bo MC. 17–2–97. [2] Bo Rev to CD. 31–7–97 (32). [3] The *Pychy Raja of Cotiote* (Kottayam), with capital at Pazhassi (49 M/9), claimed both Kottayam & Wynād *taluks*. MRO. Map 173; MRIO. 124 (9) & 134 (8); M to CD. 18–3–1801 (254). [4] Deputy SG. Madras, 1818–24. [5] DDn. 200 (170). Report by DSG. 5–8–83. [6] Map, MRIO. 64 (17).

CHAPTER IX

REVENUE SURVEYS

Methods of the Country — Glossary — BENGAL — MADRAS: The Jāgīr, 1767–91 — Northern Circārs, 1774–88 — Salem & Bāramahāl, 1792–9 — Assistant Revenue Surveyors, 1795–1800 — BOMBAY.

IN many countries land surveys for revenue purposes have taken priority over all topographical or geographical surveys. Such land survey may take various forms, according to the manner in which the rights of the occupier are recognized, the conditions of his tenure, and the extent to which he is expected to pay for the privilege of holding, or occupying, the land. In India the ultimate ownership of the land has always rested with the State, or rather, the supreme authority in the State. For some time before the middle of the eighteenth century this supreme authority for the greater part of India was the Mughal Emperor of Delhi. As a general rule the rulers of provinces paid tribute to the Emperor according to the reputed wealth of their provinces, and in similar fashion they collected revenues from their subordinates. In all cases the final call was met by the peasant, or *ra'iyat*, who lived on, and cultivated, the land, though between him and the ruler of the province were many middlemen. As a ruler the *ra'iyat* held the land at the pleasure of the hereditary landlord, or *zamīndar*, who was responsible for all revenues to higher authority, and used his own means for collecting from his *ra'iyats*. In case of *inām*, or *jāgīr*, lands, the landholder held the lands as a free gift, generally on account of special services rendered by him or his family.

The system by which the lands were assessed, and by which revenues were collected, varied from province to province;

> The legitimate government share of the gross produce...was one-fourth, but Akbar demanded one-third generally, and one-half in Kashmir. ... In practice, nearly every ruler, Hindu or Musalman, took all he could get, and often the principle was avowed that the... *raiyat* should be left no more than a bare subsistence and seed grain. ... Even the early "settlements" made by British officers frequently erred on the side of over-assessment, with disastrous results. ... In Bengal of the eighteenth century the information accessible was so crude that a decently fair assessment was impossible[1].

In most provinces there was some system under which a record was kept of the area and ownership of all cultivated land, and some system of assessment of revenue, with spasmodic attempts at a fair measurement of the land.

It is recorded that Rājarāja I of Tanjore (A. D. 985–1011) "carried out a careful survey of the land under cultivation, and assessed it[2]", and there must have been other surveys of which no clear record has been preserved.

Much information is available of the surveys instituted by the Emperor Akbar [10 n. 1] during the 16th century in the *Akbar-Nama* and *Ain-i-Akbari*[3], records of his reign kept by his minister Abu-l-Fazl, from which the following notes are taken;

> 7th Year of Akbar's reign. ... At the beginning of this year His Majesty directed his attention to an improvement of the administration of his territories, and passed new laws for the management of civil and revenue business[4]. ...
>
> More definite reforms were effected in the 15th...year (1570–1) when Muzaffar K — T —, with the assistance of Todar Mall, prepared a revised assessment of the land revenue, based on estimates framed by the local Kanungos and checked by ten superior Kanungos. ...

[1] Vincent Smith (562). [2] *Imp. Gaz. Madras*, II (134). [3] Frequently quoted by D'Anville & Rennell; translated, Gladwin 1783, 1800; Blochman, Vol. I, with biography of Abu-l-Fazl, 1873; Jarrett, Vols. II & III, 1894. [4] Elliott, VI (61).

The conquest of Gujarat in 1573 gave Todar Mall the opportunity for further exercise of his special abilities. He was sent to make the land revenue assessment of the newly conquered province, and was engaged on the task for six months. ... 64 out of 184 *parganas* ...were surveyed. ...

The "settlement" was made for a term of ten years, with a demand uniform for each year.

Raja Todar Mall's later "settlement" in Northern India—...Akbar and his advisers fixed the units of measurement as the necessary preliminary to survey. ...

Measurements had been formerly made by a hempen rope—...from A. D. 1575 the rope was replaced by a *jarib* of bamboos joined by iron rings, which remained of constant length. ...

The first step in the new system of "settlement" operations was measurement. The next was the classification of lands; the third was the fixation of rates. ...

Todar Mall...took no account of soils, ...and based...classification on the continuity or discontinuity of cultivation. ...

The Government share was one-third of the average. ...

Only the area actually under cultivation was assessed. The area under each crop had its own rate. ...

Akbar's revenue system was ryotwaree; ...the actual cultivators of the soil were the persons responsible for the annual payment of the fixed revenue. ... Provision was however made that the headman should be paid a commission for collection, not exceeding $2\frac{1}{2}$ per cent for work done.

Smith remarks that the system was an admirable one, the principles sound, and the practical instructions to officials all that could be desired, but he expresses "considerable scepticism concerning the conformity of practice with precept[1]."

Akbar's survey was extended into Bengal:—

In the time of the kings the particulars of the measurement were as follows. During the reign of Akber, Rajah Toorul Mull made the measurement in Every district in Bengal, in conformity to the Customs respectively Established in them. Different places being different in their local circumstances, and the practice of measurement diversified, these arrangements were attended to in the Mofussil Serishtas. ...

The Country was then covered with Jeels or Jungle; on these accounts in many places it not being practical to Effect the measurements of the lands by means of a rope, the lands were rated by a Toomar Jumma, the number of begahs...being Estimated, and the Jummah fixed accordingly.

In such places, on the other hand, as were free from water or Jungle, and in good condition for cultivation, a measurement being made, the Jummah was rated according to that standard, and called Tuzumy. ... Many mahals...were never at that period submitted to measurement. ... The Zamindars of such Purgunnahs were unwilling to submit to the measurement of their lands, from the apprehension of diminishing the revenue by introducing a new Custom, being used to make an arbitary Settlement with their Reyatts [142]. ...

The business of measuring lands being of so great importance, the persons employed in it should be men of ability. Their functions will be difficult and intricate; the measure of the Cottah & Begah is various and the names appropriated to these measures vary also. In some districts three different standards are in use: One of the Zemindar, a second of that peculiar to the place, and the third of Government: by which last the Cottah and Begah is of larger dimensions than by the two former. ...

Such a business requires a man of respectability. If such a one be Employed as an Aumeen, the measurement of any place having once been made by him, there will be no occasion for a repetition of it. But if, on the contrary, a careless or incapable person be Employed, it becomes necessary that the business should be done a second time, & such is the Custom of the Country[2].

The indigenous method of land-measurement by simple geometry is commented on by Macrabie, brother-in-law and private secretary to Philip Francis;

We drove out again to the Gardens. I have been stalking all round and showing the Boundaries to a Black Surveyor. How the plague these people measure land I cannot conceive. They neither use the compass nor take sights as our people do, and yet they get the contents of ground with tolerable accuracy. It is by a means of Squares, I believe[3].

[1]Smith (370–6). [2]Report by a Bengal official; B Rev Bd. 21–12–89 (31). [3]Journal, Calcutta, 13–2–76, Francis, I (260).

By the time that the English came into possession of Bengal there remained no periodical system of revenue settlements, or land measurements;

Most native Governments made rough "annual settlements". Akbar had preferred longer terms, and actually, the Bengal "settlement" made by his finance minister Raja Todar Mall, lasted for seventy-six years.

In the 18th century everything fell into confusion. In Bengal the village communities ...dissolved, and the *kanungos* ceased to maintain their records properly. ... Individual zemindars...developed into hereditary potentates, each controlling a huge extent of country[1].

GLOSSARY

Before proceeding to give an account of the revenue surveys undertaken during the early years of the Company's administration, it will be well to give a glossary of the more common Indian terms[2].

Amīn. A native official appointed to collect revenues or to investigate and report their amounts; or employed on land measurement.

Band-o-bast. The settlement operations under which the amounts of revenue to be paid on the land are settled in detail.

Bīgha. An area of one square *jarīb*, a unit which varied according to the length assumed for the *hāth*.

Hast-o-būd. Literally *that which is and that which was.* A comparative account, generally made by a measurement, of the assets or resources of a country immediately before the harvest. A detailed enquiry into the financial value of the lands.

Hāth. The primary unit, taken from the length of the fore-arm. No two districts accepted the same length.

Jāgīr. An area of land held free of tribute.

Jama-bandi. A measurement of the lands, with assessment of the revenue to be paid on them.

Jarīb. Measuring chain of 80 *hāths* or 60 *gaz* in length.

Kānūngo. An official responsible for maintaining revenue records and accounts.

Kista-būd, or *qistbandi.* Rent-roll showing the actul measurements and area of the land, and its appropriation.

Mālguzāri. Rent-paying lands.

Ra'iyatwāri. Dealing direct with the individual peasant landholders.

BENGAL

In November 1757, whilst waiting for Mīr Jafar to sign the formal grant of the Twenty-four Parganas [12 n.7], the Secret Committee at Fort William recorded the following resolution;

The Committee now took into consideration in what manner to regulate the Lands when we receive the Grant of them from the Nabob, & it being judged necessary for one person to examine into the extent & Nature of the Territories to be held by the Company in Farm, to enquire into the Revenues now collected by the Nabob, Zemindars & Holders of the Pergannas, to scrutinize and lay before us what advantages may be made of them by following any particular Plan, and to execute the said Plan, Collect the Revenues, &c.

It is unanimously agreed Wm. Frankland Esq. should be appointed to that Employ[3] [13].

In the following month Clive wrote from Murshidābād that,

The Conangoes having finished the Survey of the granted Lands, and ascertained to what Purgunnahs they belong, the Purwannah for them is at last drawn out and signed by the Nabob[4]...

on which the Committee resolved,

The original Sunnud for the Lands being received, Agreed, We request of Mr. Frankland to set out without delay on the Survey of them, and take possession in the name of the Company as he goes along[5].

[1] Vincent Smith (563). [2] cf. *Murshīdābād Letters.* Index. [3] BS&M. 12–11–57. [4] From Clive, 23–12–57; HMS. 809 (290). [5] BSCC. 4–1–58.

Frankland's report was eagerly awaited, one member writing,

At the time Mr. Frankland was appointed...to take a Survey of the Lands, I proposed some other Gentleman...might be appointed to accompany him in the Survey, but as the rest of the Committee were of a different opinion, I acquiesced, induced thereto by the imagination that the Survey would be compleated in a month. ... I find so long a time as three months has elapsed since Mr. Frankland set out on his survey, and as yet we have no account laid before us, nor...can we expect any for four months[1].

In due course Frankland submitted his survey, giving the number of *bīghas* with other statistics; it was forwarded to the Directors who replied;

With respect to the Lands ceded to us, Mr. Frankland's letter is too prolix, and not very intelligible, but his account of the different pergunahs, the Grounds, and the Revenues are judicious and clear; the barren and untenanted Lands are very extensive, but through Care and Attention We shall hope for large increased Revenue improvements.

You are certainly right to order an exact measurement of all our new acquired Lands, but we hope by more than one Person, and at no great expence; such persons if they have judgement, may from their observation of the different Grounds be able to furnish you with many beneficial hints[2].

The Company's servants had at this time no experience whatever of revenue administration and it is recorded that,

From the treaty of 1757 up to July 1759, the Pergunnas were farmed by the Company, but a suspicion arose that they had not a perfect knowledge of their value, and they were put up for sale by public auction, as the only means of arriving at this knowledge. The sale produced 7,65,700 sicca rupees, which, with the royalties, estimated at 1½ lacs, made a total of over 9 lacs; deducting Clive's Jaghire[3] of 2,22,000, this left a revenue of nearly 7 lacs.

After Cameron's survey of the district boundary in 1761–2 [13], he was directed to make a "Survey & Measurement of the several Pergannahs", and it was

agreed the same opportunity be taken of making a Register of the Villages, Tenants, &c, and that each Gentleman of the Committee of Lands do for that purpose appoint a proper Person to attend Mr. Cameron during the measurement of the respective Pergunnahs under their management[4].

Cameron continued to work for "the Committee of the New Lands" till his death two years later, but we have no record of the work done [13], nor of anyone carrying it on, though possibly Stuart and Martin may have been so employed [137].

The conditions of the cession of the provinces of Burdwān, Midnapore, and Chittagong made by Mīr Kasim in 1760 [21 n. 7] were that the Nawāb should "be vested with the administration of all affairs of Provinces", and that

for all charges of the Company and...army and provisions for the field, the Lands of Burdwan, Midnapore and Chittagaum shall be assigned. ... The Company is to stand to all losses and receive all the profits of these three Countries[5].

The actual collection of revenues was left in the hands of the former Indian officials as agents for the Company until 1771, when the Controlling Committee of Revenue[6] was established at Calcutta, and the functions of the Supravisors [137] of districts changed to those of Collectors of Revenue[7]. From this time each district had a fresh settlement of its land-revenue every five years.

The impossibility of the Company attempting to undertake any close control at an earlier date will be realised when it is considered how small was their staff of officers, none of whom were really trained in administration; in 1761 the Council had written home,

We are extremely in want of Assistants for the Business of all our Offices; our whole list consisting of only 66 for the service of the Presidency, and all the subordinates. The Engineer and his assistants are of this number[8].

Continual anxiety was expressed from home as to the amount of revenue that could be collected from the provinces;

Although the increase of the Revenue of this Province [Chittagong] is very agreable to us, yet much remains to be done before We can be assured that We draw all the Advantage

[1]BSCC. 14–4–58. [2]CD to B. 1–4–60 (94, 98). [3]Granted by Mīr Jafar in 1759, being the quit-rent due by the Company to the Nawāb. [4]BPC. 19–4–64. [5]5th para. of treaty with Mīr Kasim, BSCC. 27–9–60. [6]Superseding *Controlling Council* of Murshidābād. [7]Foster. [8]B to CD. 12–11–61 (119).

of which it is capable, and therefore direct you to cause an Actual Survey to be taken of the whole Province, that we may know what is cultivated, what waste, what pays taxes, what free, and how the whole is disposed of. ...

We have already approved the Method you took to ascertain the Value of the Calcutta Lands, you write us it has increased the Revenue[1]...

and the Council report that,

By an account of the Jummabandi, or new measurement, of part of the Calcutta Purgunnas lately delivered in by the Collector, it appears that the rent of them for the present year...amount to Sicca Rupees [274 n. 3], ...we hope that a proportional increase will arise from a re-measurement of the remaining purgunna which we have now ordered[2].

In 1768 the Collector-General writes,

I request your instructions...whether I must continue to collect the Rents of the Calcutta Lands at these rates henceforth, or in what manner you may think proper to have the Surveyor's Office re-imbursed. I further request your sentiments as to the future Establishment of the Surveyor's Office[3].

From the heading of Martin's map [51], it is probable that these *Calcutta Lands* were the same as the *New Lands* of the 24-Parganas which Cameron had started to survey [136]; and the surveyor just referred to may have been a certain Alexander Stuart, who, being

lately employed in surveying some of the Calcutta Lands, sends in a letter requesting payment of wages he advanced to his assistants and servants previous to being called in.

The Hon. the President acquaints the Board...that his surveys are so very incorrect, and he has been so inattentive to, and neglectful of, his duty, that he thinks him unworthy of any Indulgence whatever. ... The Board decide...that we shall not therefore repay him the money he applies for[4].

As early as 1766 some effort was being made to investigate the state of the revenues of the more distant provinces;

Mr. Verelst [22 n.4], as Supravisor of the Midnapoor Revenues, lays before us an account of the situation of the Jungles to the Westward of Midnapoor, agreably to the ancient Statement,

and the Resident was instructed,

To persevere in a scrutiny of the Zemindars' private account, and obtain the most exact valuation possible of the Midnapoor and Jellasore Lands. To visit the several Pargannas in order to ascertain upon the spot a more accurate knowledge of the subject, and to redress the Complaints of the Riots[5].

In 1769 English Supravisors[6] of Revenue were appointed with the following instructions,

To investigate & ascertain in a minute, clear, and comprehensive manner, a variety of circumstances which intimately concern the welfare of the country; ... The State, produce, & Capacity of the Lands.

The first measure...is to procure a compleat kistabood or Rent-Roll with the number of Bighas or Measures of Land contained in each district, according to original Surveys & Measurements, and the method in which they were laid out and appropriated.

The next is to fix the ancient Boundaries & Divisions. ... The title of the Present Possessions should...be examined, together with the valuation of such Lands before they became Talooks. ... You are also to particularize the Extent, Production, & Value of Jagheeres, the Titles of the present possessors &c. ... Among the chief effects which are hoped from Your Residence...are to convince the Ryott that you will stand between him & the hand of Oppression; that you will be his Refuge & the Redressor of his Wrongs. ... Having thus obtained sufficient & authentic accounts of the Rent Rolls of the Districts, by searching into the Papers & Record, ...comparing their respective Husto-bads, surveying & measuring the lands which appear rated above or below their value or extent, you are to bring your investigation home to the Zemindar[7].

The Supravisor at Purnea describes the native system of collection as "sheer plunder";

The method pursued for these last few years has been as follows; At the beginning of the year they have made a kind of estimated Bundibust with the Aumils, but without

[1] CD to B. 24–12–65 (46, 56). [2] B to CD. 31–1–66, (70). [3] BPC. 26–8–68. [4] BPC. 15–8–68. [5] BSC. 13–3–66. [6] For view of the work of these Supravisors, see *Murshidābād Letters*, Introduction *et seq.* [7] BSC. 16–8–69.

finally settling what they were to pay, only limiting them in their charges. At the time of the Harvest they have sent Aumeens into all parts of the Country to measure the cultivated lands, and then Sezawuls to collect accordingly; by these means they have at least had it in their power to lay hold of whatever the Tenants had by industry raised[1].

The Supravisor at "Ragonautpure, Patcheet", reports about his district (now Manbhum),

This district has never been measured; but...the Malguzary has hitherto been settled by mere surmise. ... This province should be properly surveyed, by which means alone its true extent and quantity of land will be ascertained...

and asks if he should

await the arrival of a Surveyor, or if...I should send people into the different pergannahs to find out the number of Bigas of arable land contained in each[2].

The Controlling Council at Murshidābād reply,

We understand that a Gentleman has lately been sent from the Presidency to compleat a survey of all the Western Provinces[3], but we do not apprehend the result of such a survey will afford you the knowledge you wish to acquire in regard to the Quantity of Land and the nature of the Cultivation. These informations, we apprehend, must rather be obtained by an actual mensuration, and local inspection of the Country[4].

About this time the Chittagong Council report that they have carried out a survey of their lands, but have no confidence in the results;

The mensuration of the Lands of this Province which cost...so much money that a just assessment of the ground should take place, has rather been a Burthern than any ease to the Lower class of Inhabitants, and prejudicial to the Public Revenues.

The venality of the Black Servants employed in the measurement of the Country, having for a valuable Consideration excused the rich, and rendered a short measurement of their lands, and the Poor who were incapable of complying with their demands have had theirs measured with the most rigorous exactness, and the formation of the Jummabundy, in consequence of the mensuration, has been so partial through the Arts of the Black servants in office here, that to this cause alone the fixed Revenues of this Province...have been annually realised, and therefore may rather be deemed nominal[5].

The efforts of the Supravisors to make measurements through the agency of *amīns*, met with strong opposition on the part of the landlords, one of whom makes the following complaint;

The Supervisor of Bhettoriah has sent an Aumeen to the Jaghier, who interrupts the Collection of the Revenues, and measures every particular Division of it. I am hopeful that you will give an order for recalling the Aumeen, that the Ryotes, being delivered from his oppression, may attend to the Cultivation of their lands and the Payment of their rents.

and the Council write to the Supravisor,

As you have received no orders from us for entering upon this measurement, we do direct that you immediately withdraw your Aumeen, and immediatly restore to Rajah R—'s Agents whatever collection he may have made from the Ryots[6].

It was soon realised that there were great objections to basing the collection of revenues on native measurements, and that collection through the agency of rent-farmers was simpler to work; the Supravisor at Hooghly writes,

Being persuaded therefore of the inefficacy of a measurement in which there is so much room for Fraud and Collusion, and that Annual Farms will by the competition of individuals at the commencment every year raise the lands to an adequate revenue in the course of three or four years, ...

he recommends that "the latter method may be adopted[7]".

The choice between the two systems was decided differently from one district to another; it was often very difficult to find suitable farmers.

The Supravisors had no powers to interfere with the collection of revenues in any way; they could only watch and report what they saw. The number of civil servants available was at that time far too small to take over the administration of so vast a country, with no sort of staff that could be trusted. The Collectors

[1] BSC. 12–10–69. [2] CCRev. II (14), 12–1–70. [3] It is not known to whom this refers; possibly Carter [32]. [4] ib. II (17), 3–12–70. [5] *Chittagong Dist. R.* No. 371, June 1770. [6] CCRev. II (302), 20–6–71. [7] b. VII (91), 21–12–71.

appointed in 1772 were only a little better off in that they were now fully responsible.

Detailed investigations or measurements were not encouraged by the Directors, who in a letter of July 4th 1777 expressed "disapproval of the Governor General's Scheme for a new investigation of the Provinces, by the deputation of Native Aumeens into the Districts", and later noted that

one of those Aumeens has been furnished with a guard of 50 Sepoys from Dacca without the knowledge of the Commander in Chief. It appears that N—l has also deputed subordinate Aumeens, for whose protection the Governor General seems to think part of this Military force might be necessary. We confess ourselves alarmed at these proceedings, and more so when we consider that Zimindars and other respectable Inhabitants...should be liable to vexatious inquisitions[1].

In 1779 an effort was made to put the survey of the lands of the 24-Pargannas on a regular footing, and the Calcutta Committee of Revenue write,

Finding that considerable tracts...were held by individuals in the 24 Pargannas on grants from the former Collector-General, yielding little or no revenue to Government..., we find that in...May 1771, the Collector General issued 81 grants...of lands, which had either become wild or always been in that state.

They recommend

that the jummabundee should be formed every ten years: that a survey of the Lands granted should in 12 months be made by the Company, so that a description of their boundaries might be inserted...to the grant. ...

Many people under the authority of these grants had cultivated considerable tracts without paying the smallest Revenue to Government, ...there were even some who had cultivated and possessed themselves of Lands without holding any title, and without paying revenue. ...

This committee, so long ago as...1776, ordered that *Aumins* should be sent into the districts, but no provision was made for the support of the *aumins*, and they were left to receive their pay from the Talookdars themselves, who were particularly interested in frustrating the intention of their appointment. ... Their investigation was consequently incomplete...they surveyed only a part of the lands. ...

Of about 1,75,000 given out in grants, the Ameens had surveyed 35,637 Beegas that were still wild or waste, and 5,805 that were brought into cultivation. That the Jumma of revenue for the cultivated ground for year 1184 amounted to Rs. 5,710, but only 980 had been collected.

The Committee then recommended that

a separate office should be formed in our Cuchery whose duty it may be to survey all the lands possessed under pretence of these grants, to ascertain such as are illegally held, to distinguish how much land each possess or has brought into cultivation, ...to fix the revenue which each...ought to pay for the ensuing year...

and they asked for provision to be made for payment of the *amins*[2].

In 1789 a ten-year settlement was undertaken in all Bengal Districts, and the following notes about the necessary measurements were left to his successor by the Collector at Comilla;

The Munsiff will demand...the *Chittas*, or accounts, of the last year's measurement, that he may ascertain the *Daugs* or divisions, but when he has got them, will, if the Reiatts liberally pay him, make out an account from them without measuring the lands at all; ... an experienced Munsiff will measure the whole, both with a view to manage the Reiatts, and secure himself if he is likely to be punished with severity. In the field they generally set down the real length and breadth in dots, & afterwards at their leisure draw figures over these dots, according to their agreements with the Reiatts, but as they will be stiff & not fluent like the rest of the writing you may easily see that deception has been practised by a bare inspection of the Chitta. It is not only in the quantity of the land but in the quality that you be deceived. ...

The difference occasioned by these manouevres is too considerable to be slightly passed over, being nearly equal to one half the Revenue at least. To detect the imposition you must go into the detail yourself; it is an object of too much importance to be trusted to native Agents. *Purtal* is the term for a re-measurement, but the manner in which it is

[1] CD to B. 30-1-78 (60). [2] Calcutta Com. of Rev. 7-5-79.

conducted is partial and oppressive; the Purtal Munsiff does not measure the whole village he is sent to, but a few parcels of Land only, & in proportion to the concealments found in those parcels of land, charge the whole village with what is called a *duk*. ...

The chicanery of the munsiffs is however upon a confined scale when compared with that in the *Ameeny* & *Jummabundy* Serishtas; the Munsiff has but a village or two to exert his talents in, but these Serifhtas have the whole Zemindary for the display of their abilities; ...Nothing but indefatigable attention & local knowledge will carry you thro' so as to do equal Justice to the Reiatt & Government; As every Reiatt is personally concerned, their applications to you will be innumerable. Justice requires that their complaints should be heard & redressed if well founded[1].

The Collector of Sylhet met with considerable opposition from the *zamīndars* especially along the borders of the district; he writes:

I have as far as possible completed the several measurements of the district, but the management and examination of the papers will not be effected under four or five months. ...

Many advantages...will result from the Hustobood. No revenue will be demanded from the natives which the apparent condition of their land does not justify. Government will know what they possess, and by the knowledge, provided they do not exact too large a share of revenue, will have a right to insist on a punctual performance of their agreements. ...When a Hustabood has been once made with tolerable accuracy, I think the jumma ought to be fixed for over, otherwise the Hustabood papers will be constant scourge over the head of the land-holders. By the Hustabood the constant litigation in this district will be much less frequent[2].

and a few months later;

I adhered to the Hustabood papers, which may have been falsified for private purposes. Abadie lands[3] may have been concealed out of favour, and in other instances Junglah lands may have been measured as abadie. Where any have been concealed it is not so material, as the welfare of the chowdrie and ryot is ultimately and truly the advantage of the Government. By overrating, temporary profit only is obtained at the expence of the country, but when pique or some other motive has caused Junglah to be rated as Abadie, some allowances must be made.

During the course of the year, especially if I can find leisure, before the setting in of the rains to go into the mofussil, I shall learn where the assessment bears too hard; ...a deduction will willingly be granted[4].

and again,

The hustabood of the district did not orginate with me. It was recommended...by my predecessor. ... In December...as soon as the rains would admit, I entered on the disagreable task; and in the execution of it...I have received every possible opposition from the Cannongoes and principal Mussalman inhabitants, who had obtained great advantage for the depression of the zemindars. ... Against such opposition...I consider myself fortunate in having effected the measure, at a small expence to Government, with a considerable increase of Revenue[5].

In 1793, under the administration of Lord Cornwallis as Governor General, the terms of the decennial settlement of 1789–90 were made permanent, with the result that a great part of Bengal, together with other portions of India, became liable for no further increase in revenue. The information collected previous to 1789 regarding the limits and areas of existing estates was incomplete, and probably in most cases very inaccurate, so it was not long before the Collectors of Districts found themselves in difficulties when deciding what land had actually been included in the permanent settlement. It is interesting to note the prophetic comments of Warren Hastings on the subject a few years before. Writing his memoirs on board ship during his voyage home in 1786, he observes,

I shall only further observe on the proposed plan of restoring the zemindars to the possession of their lands, and the management of their Revenues, that unless care should be taken at the same time to establish some mode of guardianship, with a view to remedy the defects of minority, profusion, and incapacity of the Zemindars, their restoration...will often terminate in acts of the greatest severity; in the total dispossession of the Zemindars, or in concession on the part of Government in their demands for the Revenues[6].

The subject was complex, and gave rise to heated discussion;

[1] B Rev Bd. 4–6–89 (27). [2] *Sylhet Dist. R.* III, 1–9–89. [3] Cultivated lands. [4] ib. 1–1–90. [5] ib. 24–2–90. [6] Warren Hastings, 1786 (121).

Hastings...looked to experience, as acquired from a succession of quinquennial settlements, to furnish the standard rate of the future. Francis on the other hand...advocated the fixing of the state demand in perpetuity. The same view recommended itself to the authorities at home. ... Accordingly Cornwallis took out with him in 1786 instructions to introduce a permanent settlement.

The process of assessment began in 1789, and terminated in 1791. No attempt was made to measure the field or calculate the outturn, as had been done by Akbar. The amount to be paid in the future was fixed by reference to what had been paid in the past. At first the settlement was called decennial, but in 1793...it was declared permanent. ...

Shore[1] [81 n. 14] would have proceeded more cautiously than Cornwallis's preconceived English idea of a proprietary body, and the Court of Directors' haste after fixity, permitted[2].

In a review of the system written in 1883, nearly 100 years later, it is stated[3],

The claim of Government against the Zemindars was fixed for ever, and the Law intended that the rights of the Zemindars over their own tenants should equitably be restricted. But no detailed record of Tenant-right was inserted in the settlement papers. The rights of the Landlords as against the State were defined by the regulations of 1793; the rights of the tenants as against the Landlord were reserved, but were not defined; ...it was taken for granted that the law-courts would afford sufficient protection to subordinate rights. However, large zemindaries were speedily broken up; widespread default in payment of Government dues, and extensive sales [followed].

By the end of the eighteenth century the greater portions of the Estate of Nuddea, Rajshahi, Bishenpor, and Dinajpur Rajahs had been alienated; ...a host of smaller zemindaries had shared the same fate[4].

Although the permanent settlement rendered measurement of lands belonging to *zamīndars* of no account for many years, yet there were other lands which called for surveys, as shown by the following letter from the Collector of Shahābād in 1800;

I beg leave to submit to the consideration of the Board the expediency of having an accurate survey and measurement made of the lands, the property of the Government, by European Officers qualified for the task. The benefit which would be immediately derived from it, in detecting fraudulent evasions, in the disposition of reservoirs to the most advantage, and in establishing boundaries beyond the possibility of dispute, would amply repay any expence with which it would be attended[5].

Nothing came of this request at the time.

MADRAS: THE *Jāgīr*, 1767–91

On hearing of the grant of the *Jāgīr* lands by the Nawāb of Arcot [86], the Directors were prompt in ordering them to be surveyed;

With respect to the Lands & Territories ceded to us by the Nabob, ...We esteem it a Work of that importance to have accurate surveys of them, that no time must be lost; you are therefore to cause the same to be set about immediately[6] [88].

and in March 1767 the Council record that,

The Engineer...has sent Mr. Barnard, one of his assistants, with proper Instruments and attendants, to make a survey of the Company's Jageer Lands round Madrass, and has given him the following instructions, ...

1st. You will survey as exactly as possible, on a scale of two inches to a mile at least, the whole extent of Country comprehended within the limits of the Jagheer lately granted to the company by the Nabob, beginning on the North of Madras, & so continuing along the Sea side till you reach the Northern extremity, and that you may be more certain what Districts and villages compose this Jageer, a List of them is annexed hereto.

You have also a person sent with you to serve as an Interpreter, and orders from the Nabob (now Renter of this Jageer[7]) to his Amuldars to assist you. ...

2ndly. In the course of your Survey you are to be particularly careful to note the Nature of the Country adjacent to, and between, each village, whether it be fit for cultivation of Beetle[8] & Paddy, or dry grains, ...or whether it be Pasture Land, Woody, or Sandy.

[1] Recognized by Cornwallis as the most trustworthy of his local advisers. [2] *Imp. Gaz.*; *The Indian Empire*, II (487). [3] For a scathing indictment of this settlement by a revenue officer of long experience, see Vincent Smith (566–70); see also Hunter's *Bengal MS. Records*, Vol. I. [4] *Land Revenue*. cf. *Old Rev. Surveys* (iv). [5] B.Ter.Rev. 27–5–00. [6] CD to M. 24–12–65 (12). [7] As the simplest way of administration, the *Jāgīr* had been farmed out to the Nawāb. [8] The Betel Palm.

3rdly. You must carefully trace all rivers, or Watercourses, and mark the places where Watercourses are, or may be, opened out of rivers so as to water the adjacent Grounds, and render them proper for the Cultivation of Paddy.
4thly. You must exactly Survey all Tanks, remarking the Water Courses that lead from them, and how they are supply'd with Water, whether by rain or from any River [107–9].
5thly. As the collection and Preservation of Water is the grand Object of Cultivation, You are minutely to enquire into the state of each Tank or Reservoir, and report how it may be repaired or improved, and at what expence, and you must also note what Countries or Grounds are water'd thereby. ... You are, moreover, to enquire whether any new Tanks can conveniently be dug, in what part, and at what expence [146]. ...
6thly. You are to remark on all Hills, Woods, or Waste Grounds, and trace with Exactness all Roads, observing at the same time...whether good or bad.
7thly. You must enquire from the Amuldars...what Improvements can be made...for the mutual benefit of the Inhabitants & the Company, and obtain the best account you can... of the yearly produce of each village, both within the last 5 years, & in the time of Doast Ally[1]. ... The different Produces you'll note opposite the Name of each village in your list of villages. ...
8thly...Number of Inhabitants. ... Manufactures[2].

Barnard saw that single handed he could not possibly carry out these instructions in full, so after two months work he obtained permission to modify them. He covered his country with a network of traverse circuits, just as in modern revenue surveys, and in the southern area took advantage of the hills for occasional triangles [189–90].

He did not find the Nawāb's officials as helpful as they should have been, and had to write to the Board

representing the difficulty he finds in obtaining an account of the value of the Jagheer Lands, owing to the neglect and inattention of the Amuldars and other people belonging to the Circar, who studiously endeavour to prevent his procuring any information on that Subject, and that unless some speedy and effectual remedy be applied, it will be out of his power in a great measure to execute that part of his instructions[3] [140].

After protesting to the Nawāb, the Board reported to England,

Mr. Barnard...advances but slowly. He hath often represented the delays and impediments he met with from the backwardness of the Managers & Chiefs of the Districts in giving him the necessary assistance; the Nabob has been frequently requested to issue his orders that Mr. Barnard may have all proper helps, and he hath promised to do so, but without much effect.

When this survey shall be compleated, We hope to acquire a more accurate knowledge of the value of these Lands than hath hitherto been practicable[4].

The large scale of the survey made serious inroads on the stock of drawing paper;

Mr. Thomas Barnard has nearly compleated the Survey of the Jaguire, but is much distressed for Vellum & drawing paper. We request at his desire that you will be pleased to order forty skins of Vellum of the largest sort, with a Quantity of the largest sort of drawing paper to be sent to us, ...almost as large again as Imperial[5].

The field work was practically completed during 1772, but more than a year was required to finish the drawings, reports and statistics, and a civil servant, Jewell Call, was attached to help. In submitting his report Barnard writes;

Regarding the State of the Country, and the improvements which might be made, I had recourse to the records which are kept in every village; ...the insight I obtained of this matter was furnished me by the Interpreter appointed by Colonel Call. ...

The extract I caused to be made from the records contain the quantity, disposal, and appropriation, of the grounds in every village; the number of the Inhabitants, with their possessions and privileges, where they are entitled to any; also the total of cattle in every village[6].

He also comments on the system of farming out the rents, and the oppression that resulted.

Other surveys of less importance followed. In 1776 Dugood was employed on a survey of the "Home Farms" near Madras [94], but was transferred before he could complete it;

[1] Dost Ali. Nawāb of the Carnatic, *c.* 1740. [2] MPC. 5–3–67. [3] MMC. 10–7–69. [4] M to CD. 27–6–69 (13). [5] M to CD. 28–2–72 (109). [6] MRC. 20–12–74.

From Mr. Dalrymple[1] I had no written Orders...relative to the particular business; ... the verbal ones, to the best of my memory, were;

To draw it on a large scale so that everything might be shewn, & he approved of the scale of 220 yards to an inch. That it should be executed with a Pen for the purpose of being engraved from. That the Paddy Grounds, Estates, Water Channels, etc., should be exactly surveyed. And when he last saw it, he approved of the method and desired it to be continued.

I likewise now deliver you a part of the Survey of the Jaghire by Mr. Barnard, and an old Plan of St. Thomé Redoubt, both of which I received from Mr. Dalrymple. Mr. Beatson has surveyed & drawn a correct Plan of this Building with a Pen, as per Mr. Dalrymple's directions[2].

In 1785 it is recorded that three surveyors were employed "when absolutely necessary" on the "Company's Lands", presumably at Madras, under the Committee of Circuit [*inf*], which had been reconstituted in 1780[3].

In 1788 Norris, of the Engineers, was employed under the Chief Engineer on surveying grounds for new settlers in certain village areas near Madras, and reports,

It is my duty as a surveyor to inform the Board of Revenue, on examining the Papers originally made out by Mr. Barnard 14 years ago, with the grounds, that my survey considerably exceeds his, and on a comparative view...all advantages to the cultivators is at least 12% under rated[4].

and in 1791 the Chief Engineer reports that,

There is but one Engineer, Lieutenant Norris, now on that Establishment [Surveying]; he has been employed of late in surveying and adjusting claims in particular places of the Jaghire for the Board of Revenue[5].

Beyond the *Jāgīr* and the Northern Circārs the Company possessed no other lands under the Presidency of Fort. St. George except small areas at Cuddalore and Devicottai which were surveyed in 1775 by George Cadogan, of the Civil service[6].

NORTHERN CIRCĀRS, 1774–88

Revenue surveys in the Northern Circārs were few and scattered; in 1774, Andrew Scott, a civil servant "having recommended himself by a knowledge of Drawing & Surveying" was appointed to survey "the Home Farms under Masulipatam...to begin with the southernmost first[7]".

In 1775, during the governorship of Lord Pigot[8], the Directors ordered an investigation of the resources of the Company's territories on the Coast, with a view of their better development;

Another object of your early attention must be to acquire a complete knowledge of those territories which have been granted to the Company on the Coast of Choromandel, and to establish a judicious and permanent system for their future managment. ...

And being well assured that the Jaghire Lands and Northern Circars, and especially the latter, will be found capable of answering this desirable purpose, if duly explored and properly regulated, ...[recommend] a Committee of Circuit to tour the country and report on its resources...and devise a system of control for revenue purposes[9].

A Committee was then appointed to tour the Northern Circārs

to ascertain with all possible exactness the produce of the Country, the State of the Manufactures, the fortified places, the gross amount of the Revenues[10].

Alexander Dalrymple was a member of this Committee, and being also a member of the Council, saw that the committee was supplied with the best available maps; nothing came of this, for the committee was broken up during the upheaval that occured the following year[11] [256].

In 1776 Maxtone, who had been helping Johnston in the survey of Vizagapatam District [93], made a two-inch survey of "Wooratla[12]" pargana, and afterwards

[1] Now Member of Council, & of the Com. of Circuit enquiring into Revenue matters. [2] MMC. 6–1–77. [3] Mad. Civ. Ests. 1785, HMS. 349 (161). [4] Mack. MSS. LXIX, 5–12–88. [5] ib. 7–1–91. [6] Cuddalore, acquired 1682; Devicottai, captured 1749, MMC. 26–6–75. [7] MMC. 2–9–74. [8] Governor of Madras, 1755–63, and 1775–6 [256 n 6,]. [9] CD to M. 12–4–75 (23). [10] ib. (24). [11] Carmichæl (193 *et seq*). [12] Uratla, 65 K/10; signed map, MRIO. 137 (25).

surveyed all the Zemindary of Sattiaveram and the Havaily lands of Casin Cotah; also a Purgunnah named Uppalum Pykanadoo, adjoining to Sattiaveram[1].

In 1788 Lennon [100] was stationed at Rājahmundry, and in reporting on surveys he had made up the Godāvari [105], recommended the systematic survey of cultivated lands in the Circārs;

> The proper management of the Revenues of this Country can derive no greater assistance from anything than good geographical plans of all the separate districts, upon a scale sufficiently large to set clearly before the view the different kinds of Soil, and the exact quantity of cultivated ground, to ascertain the precise limits & boundaries of each division, ...and particularly point out the possibility of Improvement of Cultitation. ...
>
> To have exact and expressive plans of these (the Haviley Lands, in the Ganjam, Chicacole, & Masulipatam Districts), after the mode of Mr. Barnard's Map of the Jaghire, would, I conceive, be a very desirable object.
>
> I therefore propose to make surveys of each, to lay down every village, the nature of each soil, the quantity & quality of arable ground, the Tanks & Reservoirs of Water[2].

Nothing so ambitious was undertaken when Topping was sent up four years later [105], when the Directors particularly ordered,

> this should be a *mere Land Survey* expressing the kind of land, without any reference to the value, which might raise jealousy and discontent[3].

SALEM & BĀRAMAHĀL, 1792–9

The first successful *ra'iyatwāri* settlement was that made in Salem and Bāramahāl by Alexander Read [113], who held charge of these districts as Superintendent of Revenue, one of his assistants being Thomas Munro[4], famous afterwards as a revenue administrator.

> There was at this time, 1792, no successful policy of settling land revenue, either in Bengal, or in the Northern Circars and Jaghir of Madras. In the Circars, a considerable portion of the land was in the hands of Zemindars, who collected the revenue from the ryots, paying a fixed sum to the Government. The Zemindars, for the most part, employed farmers of the revenue, who made the collections from the ryots, and oppressed them grievously by unauthorized exactions. The persons thus employed were usually strangers to the country; they were employed equally in lands directly under Government.
>
> Lord Cornwallis, in Bengal, adopted the permanent settlement with the Zemindars; the Madras Government...resolved otherwise. The Board of Revenue issued instructions to Read, providing for the settlement being made with the ryots individually, for in the greater part of the Baramahal there were no Zemindars. ...
>
> For the first year temporary arrangements were made for the collection of the revenue with the aid of such village accounts as were forthcoming, and then a survey & assessment of each division was set on foot.
>
> The *Ryotwāri* system does not involve the annual settlement of the rate of assessment; all that is inquired into each year is the extent of each ryot's holding, as he has the option to give up, or diminish, or extend his holding from year to year. He is at liberty to sublet his property, or to transfer it by gift, sale, or mortgage. He cannot be ejected by Government so long as he pays the fixed assessment, fixed for 30 years.
>
> This the system which, originated in its main features by Read in the Baramahal, and extended in after years by the powerful advocacy of Munro, has long prevailed in the greater part of the Madras Presidency and in the adjoining Presidency of Bombay[5].

We have no particulars about the manner in which Read's revenue survey was carried out; it was obviously done by native measurers under the close personal supervision of himself and his three military assistants, and involved the measurement and assessment of the holdings of "upwards of 80,000 farmers". Read's great contribution to revenue administration was his code of regulations for working a settlement directly with the *ra'iyats*. It was left to Munro ten years later in the Ceded Districts [119 n.3] to work out a code of "Survey Regulations", whereby a field-to-field survey should be carried out with a staff of native surveyors under the

[1] Satiyavaram, 65 K/11; Kasimcota, 65 K/14; *Haveli lands* or *Government estate*, CD to M. 9–5–97 (51). [2] *Oriental Repertory*, Vol. II. [3] CD to M. 16–5–92 (11). [4] Governor of Madras 1820–7. [5] Arbuthnot (xl, xliii).

minimum of European supervision. In their report submitted with Read's records of the survey[1] the Board of Revenue write in 1799,

The whole of his records have...been divided into 22 sections, and when finished will form in all 60 folio volumes. [In the] 22nd section...he proposed to devise such a mode of management as may best suit the state of the country, the condition of the inhabitants, and ensure, if possible, under those circumstances a permanent revenue to Government.

We believe no investigation of revenue affairs, so able, so comprehensive and laborious, has ever been made by any European in India, as that exhibited in the Land and Geographical surveys of Colonel Read and his assistants. ... We have...been...anxious to reap the advantage...of this extensive information, towards the attainment of the ultimate object of his appointment, a permanent settlement of Revenue in the Ceded countries[2].

One of Read's regulations declared the assessment to be fixed for ever, but this was never accepted by Government, and within 10 years Government introduced the *muttadari* system, under which the greater part of the land in Salem was parcelled out into estates, and sold by public auction to *muttadars* who acted as rent collectors; this system eventually failed, and Read's *ryotwari* system re-introduced with modifications, and in some places enhancement of rent[3].

After the Mysore War of 1799, and the death of Tipu, the Salem District was enlarged by the cession of the small district of Hosūr, and the Collector, who had been one of Read's assistants, asked that the survey should be extended to cover it;

From the observations which I have, already, been enabled to make on the state of these newly acquired districts, in which I find the assessments of the villages extremely unequal, it appears to me of great importance to the future amelioration of Revenue, that the acknowledged benefits derived from an actual Survey and valuation of the lands, should, as early as possible, be extended to them.

Should your Board authorize the immediate adoption of this salutary measure, establishments, consisting of experienced Measurers and Surveyors who were employed in the Barramahal, can soon be formed, and I imagine that the whole may be compleated within two years, at the expence of about Pagodas 8000[4].

Government replied that they had no objection to so useful a measure as the Survey proposed by the Collector of Salem, previously to his settlement of a jummabundy for the districts[5].

Read's survey and settlement of the Salem and Bāramahāl Districts was the prototype of the present Indian system of cadastral surveys.

ASSISTANT REVENUE SURVEYORS, 1795–1800

In sanctioning the surveying school in 1794 [284] Government had desired that the boys should be trained for carrying out all surveys of a revenue nature[6], and it was not long before demands for their services came in from one Collector after another; for example, in 1795 the Board of Revenue wrote in regarding the Northern Circārs,

Having been informed by Government that they were not in possession of any correct map defining the extent, limits, and relative situation of the Zemindaries in the five Circars, it is much to be wished that a Geographical Survey of the whole could be obtained, and when the establishment of Surveyors under Mr. Topping is sufficiently perfected to commence on the work, we shall hope to obtain a more comprehensive map, shewing the villages of each Purgunnah or Talook, the Tanks, watercourses, and other particulars necessary in a revenue survey[7] [107–9].

For the professional supervision of these young surveyors Goldingham was appointed *Inspector of Revenue Surveys* [285], and drafted instructions [114];

I propose a General, and then a particular Survey; the first is to exhibit a general view of the country and its divisions, to enable the Board to have before them the relative situation of Places...while the detailed Revenue Survey is going on, which from its minuteness (and that forms its use and excellence) will require much labour and time.

[1] There was no attempt to map the measurements made. [2] MRC. 12–7–99. [3] Arbuthnot, I (2). [4] M Rev Bd. 26–8–79. [5] MRC. Feb. 1800. [6] MRC. 23–6–94. [7] M Rev Bd. 30–5–95.

Whilst the general survey proceeded, the Collector of the district was to be asked to have certain information about the villages collected from the inhabitants, so as to be ready by the time the *particular survey* was taken up.

In this *particular survey*, run the instructions,

You will survey each Tallook or Purgunnah in the District, by finding the contents of all the lands in each village, ...and in laying down your work you will distinguish each Purgunnah by different colours, but every village belonging to it by the same colour; you will ascertain the number of houses and inhabitants in each village, the number of cattle, sheep, ploughs and looms; the measures, weights, and current coins; the tenure by which the lands are held; the Circar share of the crops, and the share of the inhabitants when a division takes place; ... when a money rent is paid for a particular measurement of lands the measure and rate of assessment to be stated; the estimated produce of a certain measure of paddy, lands of different sorts, and of dry grain lands; the average price of paddy and dry grains in different years; you will also take drawings of the different implements of husbandry, and their dimensions, mentioning of what wood made. To enable you to obtain this information and the materials necessary to fill up all the other points in the forms, exclusive of the measurement of lands and Geographical part of the survey, and to aid your enquiries connected therewith, the Collector will appoint one or more intelligent persons to attend you, or he will himself furnish you with the particulars required.

You will survey all Tanks, yaries, Tongels, and wells used in cultivation, note the means whereby they are filled, whether such means may be improved, the state of the bank, the state of the sluices for conveying the water to the Fields, and of what materials built; if not of brick and chunam, always make an estimate of the expense of building new ones with those materials; ...you will estimate the expence of all the repairs necessary, and the benefit to be derived in consequence, and this is to be done by ascertaining the quantity of land at present watered by such a tank, and how many crops it yields. ... As great judgement and care, with a knowledge of the level of the country, are requisite to take water out of its natural course, nothing of this sort should be attempted without a particular examination of the country, ...besides an exact calculation both of expence and advantage; this will be done on the large scale by the Superintendent of Tanks, who will receive the greatest assistance from your inquiries [142]. ...

You must also ascertain if any of the old channels from Rivers, suffered to fill up, can be cleared with advantage to the country[1].

This was indeed a formidable programme to set before young boys just out of school, but this wide field of statistical enquiry was a feature of all revenue surveys for the next fifty years; Government did not now accept it in full;

Though the instructions, which Mr. Goldingham has proposed for the native surveyors, are extremely well adapted to the acquisition of useful information, they comprise a very essential part of the duties of the Collectors themselves. ... For this reason the Board are desirous that Mr. Goldingham's instructions and correspondence should be strictly confined to the scientific part of the surveys; but, as the foregoing detailed instructions, with the proposed forms, appear to be well calculated for regulating the inquiries of the Collectors, the Board think that the best means of making them useful, and of avoiding the interference which they apprehend, is to transmit them by the authority of the Board of Revenue to the Collectors[2].

In sending out the three young surveyors to work under the Collector of Dindigul [114], the Board of Revenue wrote to the Collector,

Although the Board have pointed out what appears the best mode of proceeding, they must leave it to the Collector to take such measures as may appear to him best calculated to obtain with the greatest accuracy the information required by the forms annexed to the instructions, exclusive of the measurement and discrimination of the lands, and the geographical part of the survey; ...

and further,

that Mr. Goldingham is appointed "Inspector of Revenue Surveys", and that the Assistant Surveyors are to report to Mr. Goldingham thro' him on points relating to the scientific part of the survey; and that when all the materials are collected, they are to be brought down to his office to be arranged, protracted, and the astronomical observations computed under his immediate inspection[3].

The boys were first employed on the survey of disputed lands, but they were not sufficiently experienced to give the Collector all the help that he wanted; for

[1] M. Rev. Bd. 22-12-96. [2] MRC. 30-12-96. [3] M Rev Bd. 30-1-97.

besides wanting a complete geographical survey, he required assistance in dealing with

the various sources of Revenue to be enquired into; the many translates of schedules; the constant and bitter complaints against the Amins and their Cacharies, to which I am obliged to give an attention which delays the information I am preparing for your Board[1].

As the eldest of these boys sent to Dindigul was only 18 years of age, whilst the youngest was 15, it was hardly to be expected that they could give much assistance beyond the simplest of measurements or plans. What the Collectors really wanted at this time were experienced geographical surveyors such as Mather [113–5], and competent European assistants to supervise their native *amīns* and measurers, such as Read had in Salem & Bāramahāl. The Collector of Guntūr expressed the general need of all district officers at this time, when asking for the services of Captain Orr

to take a survey of this Circar, more particularly to enquire into its extent, Boundaries, Divisions, Soil, Cultivation, Produce &c, which subjects are at present but partially and indifferently known from the representations of Natives, generally ignorant, frequently interested in misguiding the Collector. It is therefore an object very much to be desired that a Person of known integrity and sufficient ability would undertake the labor of such a survey, which the Collector from his other avocations is not able to execute[2].

Orr could not be spared, but two boys were sent up from Goldingham's school [115].

In the course of a few years a great deal of valuable work was turned out by these Assistant Surveyors, more particularly in providing district officers with general maps shewing the main topographical features, villages, and internal boundaries, but the only district maps of this nature existing in Madras in the year 1800 were Barnard's map of the *Jāgīr*, and Mather's map of Bāramahāl.

BOMBAY

It is from Bombay that we have the earliest record of a survey carried out in India, a Mr. Herman Blake[3] being appointed "Engineer and Surveyor General" in 1670, and spending several months on a survey to show the "Works" and rights of property, which illness prevented him from completing. Other proposals for similar surveys are recorded in 1679, 1710, and 1747, but nothing is known of any action that followed[4].

In 1772 it was agreed that,

an exact and accurate survey should be made of the whole Island, that the situation of these Villages, & of all the Honble Company's Oarts[5] & Grounds may be exactly laid down as well as those of all Persons whatever...under the directions of the Collector, whom the...Principal Engineer must furnish with the most skilful persons for doing it[6].

The Collector estimated that the expence would amount

to Rs. 3,912 for 18 Months, the time supposed necessary to compleat it, including the pay to one Surveyor, &...that Lieutenant Turner is desirous of undertaking it alone, which as we are of Opinion he is a very fit & proper Person for the undertaking is therefore Agreed to [122]. ... It may be begun as soon as the Season will admit[7].

Turner appears to have made a start on the survey with the assitance of Cadet Whiteman, but had to break off almost at once to accompany the expedition to Broach in November 1772, and a year later orders were sent to Broach for his return to Bombay "for Compleating the Survey of the Islands[8]"; no record has been found of his actual work on this survey, and it is possible that the survey carried out by Reynolds and Sartorius in 1784 and 1785 may have been in the same connection [120].

[1] M Rev Bd. 11–7–99. [2] M Rev Bd. 5–1–98. [3] elsewhere called Captain Herman Bake. Sandes, I (20). [4] *Gaz. Bombay City*, II (327). [5] Groves of cocoanut palms. [6] Bo PC. 19–5–72. [7] ib. 2–8–72. [8] ib. 19–10–73.

Chapter X

ASTRONOMICAL CONTROL, BENGAL

Observations before 1760 — Rennell's Maps of Bengal, 1760–77 — Transits of Venus, 1761, 69 — Smith, Pearse & others, 1775–90 — Reuben Burrow, 1783–9 — Burrow's Measures of the Degree, 1790–1 — Burrow's Last Season, 1791–2 — Colebrooke & his Surveyors, 1794–1800.

THE value of the essential elements of latitude and longitude for indicating geographical positions had been realised as early as the second century A.D. by the Greek geographer Ptolemy [207], who, besides writing the *Almagest*, a treatise on astronomy, left a list of places with their geographical co-ordinates[1].

Both the Hindu astronomers of India and the Muslim astronomers of Arabia and Persia were indebted to the work of the Greeks. Hindu astronomy was at its height between A.D. 400 and 1100; whilst of the Muslim astronomers Nasir-al-Din was born in A.D. 1201, and Ulugh Beg, who founded a large observatory at Samarqand, was assassinated in 1449.

European astronomy made very little advance after the death of Ptolemy, and gained most of its knowledge of Greek astronomy through the Arabs.

The chief instrument was the astrolabe [206], but the Arabs also used quadrants and sextants, whilst massive masonry instruments were favoured because of their stability, and the ease with which their arcs could be graduated and read[2] [157].

The Muslim astronomers followed Ptolemy's example in preparing tables of geographical positions, but without distinguishing positions obtained from actual observation from those which were calculated from their estimated distances and directions from known places[pl. 10 n.].

Both D'Anville and Rennell drew largely from these tables, D'Anville writing;

The situation of Kabul in $33\frac{1}{2}°$ by Ebn-Maruph and the Astronomical Canon quoted by Golius...should be corrected to $34\frac{1}{2}°$, without which the North of India would be contracted about a degree, which would occasion a remarkable distortion of several situations, particularly of Lahaur and Kandahar, whose latitude appears to be pretty exact. ...

Kandahar is placed in the latitude of 33° by Nasir-ud-din and Uleg-beg, whose tables, among all those of the East, are most to be relied on. A Persian geographer...and the Turkish geographer agree in this. The Eastern astronomers have computed the difference of longitude, between Kandahar and Kabul, about 2°[3]. ...

The errors in the tables of Nasir-ud-din and Uleg beg extend to the position of Benarez, which the table makes $26\frac{1}{4}°$[4].

Discussing the position of Delhi, Rennell writes,

To the list of *data* must be added the latitudes and longitudes of the tables of Nasereddin and Ulug Beig; which...do not always agree in particulars. But we shall find them accord... in a sufficient number of points, to satisfy the reader that there is no violent disagreement in the chain of positions[5].

Rennell also makes use of tables from the *Ain-i-Akbari* [133 n.3];

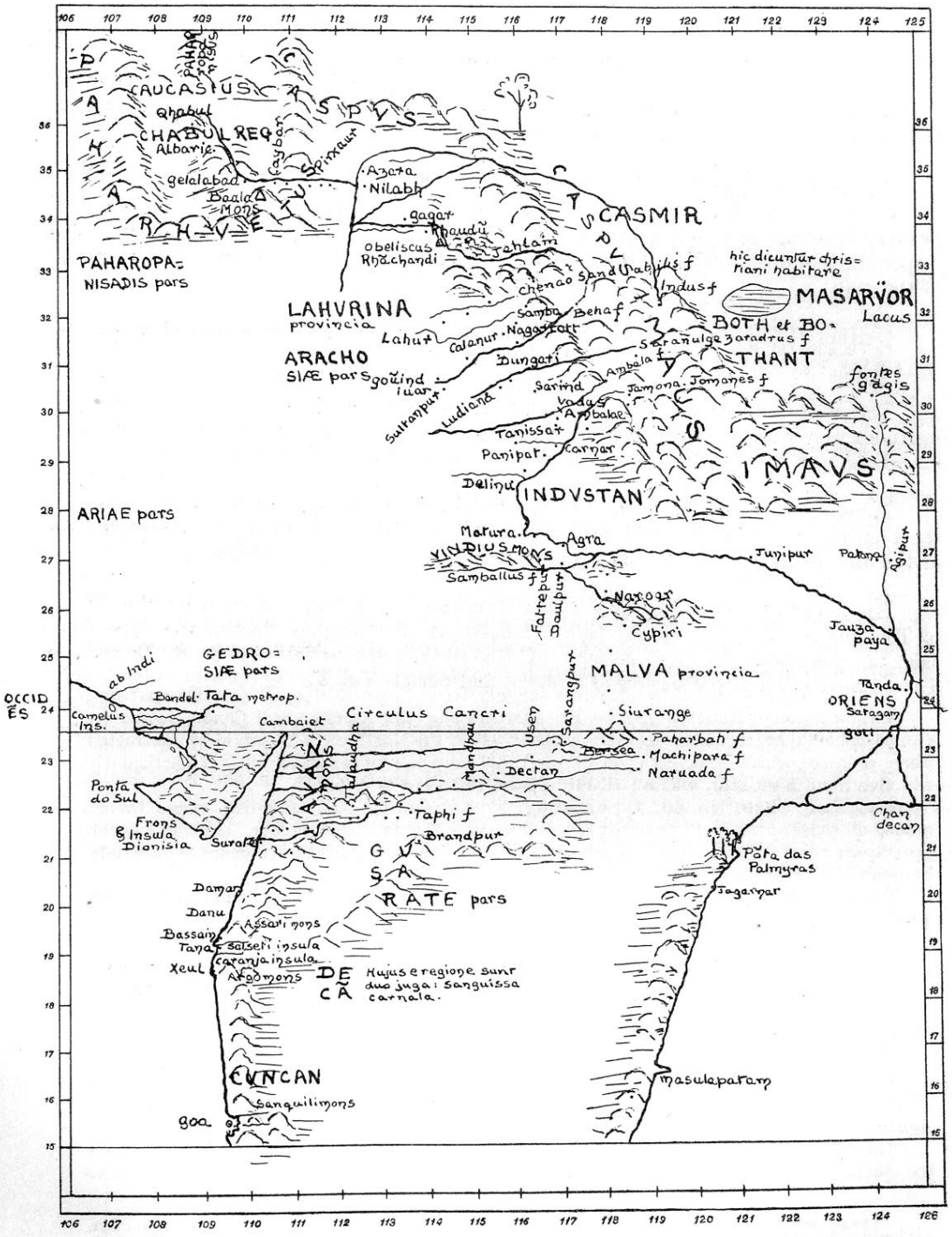
Latitude of Lahore by the Oriental Tables, 31° 50′. ... The table in the Ayin Acbaree (Vol. III, p. 55) places Sealkote in lat. 33°[6]...

again,

The Ayeneh Acbaree is much out. The difference on a medium here is 11′ in each degree too much. From such kind of materials, nothing very accurate can be expected; and therefore

[1] *Ency. Brit. sv.* Ptolemy. [2] Kaye (3–17, 70–84). [3] True positions, Kābul, 34° 31′ N.; Kandahār, 31° 36′ N.; diff. of Long. 3° 30′; Herbert (9). [4] Instead of about 25° 20′; ib. (27). [5] *Memoir*, 1793 (67). [6] ib. (81). *v.* Gladwin, II (353–87). True values, Lahore, 31° 36′ N.; Sialkot, 32° 30′ N.

After Father MONSERRATE, *c.* 1590 Plate 10



Drawn from the enlargement of Monserrate's map which follows p. 704 of Vol. III, *Memoirs of the Asiatic Society of Bengal*, 1910–14; by permission.

See notes on reverse.

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NOTES, Plate 10.

Monserrate's original map was about 5½ by 4⅛ inches in size; black for coast-line and place-names, red for rivers and their names, brown for mountains.

This enlargement is an exact copy of his border, rivers, sites, and coast-line; the hills have been simplified, and selected names re-written.

The map was drawn about 1590, and embodied in Monserrate's *Mongolicæ Legationis Commentarius*, the MS. of which, being discovered at Calcutta in 1906, was edited by Father Hosten, SJ., and published by the Asiatic Society of Bengal in 1914. Appendix C and plate XII of Hosten's paper give a full description and an enlargement of the map.

Neither D'Anville nor Rennell knew of Monserrate's map or surveyed route, but the survey was used by Call and Wilford, 1782–5 [11, 149].

The route ran from Surat, through Delhi, to Kābul, and many astronomical latitudes were observed; but, making Surat *east* of Goa instead of *west*, Monserrate made his whole map between Agra and Kābul four degrees too far to the east [149].

Monserrate gives a better idea of the Himālaya mountains and the upper courses of the Punjab rivers than Rennell did nearly 200 years later, but he had no knowledge east of the Jumna, as is evident from his depiction of the Ganges and Patna.

His longitudes are probably counted from the Pope's line as revised by the Treaty of Torsedillas of 1494, which, being defined as 370 leagues west of the Cape Verde Islands, was about 40 degrees west of Greenwich; see article by S. E. Dawson in *Transactions of the Royal Society of Canada*, 2nd Series, Vol. V.

Note the symbol ~ used over vowel to denote a nasal sound, *e.g. Gãgis* for Ganges.

See also page 209, and an article by Father McFarland SJ. in the *New Magazine*, Calcutta, Dec. 1939, No. 60, X (473–86).

I have never had recourse to them but in a very few cases, where every other species of information has failed[1].

Tieffenthaler [11] writes of these early tables,

Voici maintenant les positions que je tire de ces Géographes Orientaux;

Agra 26° 43′ N. 115° E. Panipat 28° 52′ N. 113° 20′ E. Delhi 28° 39′ N. 113° 25′ E. Kaboul 34° 30′ N. 114° 40′ E.

Quoique la Latitude assignée ici à quelques unes de ces villes s'accorde assez avec la véritable, la plupart cependant en diffèrent en plus ou en moins. Les erreurs sont plus fortes encores à l'égard de la Longitude. Il est impossible, par example, que celle de Delhi soit de 113° 25′ si celle de Kaboul est de 114° 40′[2].

Reviewing Rennell's *Memoir of a Map of Hindoostan* [213, 214], Duperron writes,

Cet habile Géographe croit avoir découvert que Caboul & Candahar sont plus Ouest, au moins d'un degré, que M. D'Anville ne les fait, quoique probablement moins qu'ils ne sont dans l'Ain Akbari; de meme que le cours de l'Indus est beaucoup plus occidental. Il diffère du Géographe françois de près de deux degrés pour la distance en longitude, du Cap Mons, extremité Ouest des bouches du Sinde, à Bombaye[3].

We now come to the valuable observations made by the Jesuit missionaries, and begin with Father Monserrate [11] who left a list of over 100 positions recorded on his march from Surat to Fatehpur Sikri[4] in 1780, and on to Jalālābād[5] the following year[6]. Neither D'Anville nor Rennell appear to have known of this list, but at least some part of it was in the possession of Wilford [pl. 10 n.], who used Monserrate's latitudes for Kalānaur and Attock[7], and notes that,

As his observations of the Latitude from Surat to Delhi are very accurate, we may suppose he was equally so in these others[8].

Monserrate's list includes a large number of places which he never visited, and does not distinguish positions fixed by actual observation; however, from a comparison of about 20 identified points along his route, his latitudes have a mean error of about 11 minutes, and some at least of these would have been observed.

He cannot possibly have made any astronomical observations for longitude; he places Surat about 2 degrees too far *east* with reference to Goa, and accumulated a *further easterly excess* of 2 degrees on his journey to Agra; he holds this error with little further change along the measured route through the easy ground of the Punjab [pl. 10 n.].

We have already referred to the remarkable journey of Fathers Grueber and d'Orville[9] from Pekin to Agra in 1661–2 [69]; Grueber had been specially trained in astronomy before he left Europe, and during his stay at Surat had observed the latitude, 21° 10′[10], and calculated the longitude from a lunar eclipse[11]; both he and d'Orville worked at the Pekin observatory[12] under Father Adam Schall before they started for India, and amongst the latitudes they fixed by astrolabe were Siningfu, 36° 20′ N., Lhāsa, 29° 6′ [69], and Patna, 24° 44′[13] [150]. Wessells points out that,

Nearly all of Grueber's latitudes are too low by 30′ on an average. Already Fathers Regis and Jartoux noticed this deviation when marking their cartographical determinations. Du Halde is of opinion that most probably his instruments were at fault, or else, perhaps, he did not take sufficient account of the sun's diameter[14].

Pekin observations were of value to observers in India, and D'Anville records, that,

By an observation at Fatepur[15] of an immersion of the first satellite compared with one made at Pekin some days afterwards, ...the difference of meridians between Fatepur and Pe-kin is concluded to be...35° 50′ and some odd minutes. Between Paris and Pe-kin, according to the nicest result of a great number of observations, which I had from father Regis, ...the difference of longitude is 114° 10 ...[giving] longitude of Fatepur...78° and some minutes[16].

Of all the Jesuit missionaries, Father Boudier is probably the best known astronomer, but it is well to introduce him by telling first of Rāja Jai Singh Sawai of Jaipur, who

[1] *Memoir*, 1783 (47) [2] Translated from the original Latin, Bernoulli, I (13). [3] Bernoulli, II (465). [4] 54 E/12. [5] 38 J/7. [6] *Commentarius* (537–9). [7] 43 P/4; 43 C/1. [8] Note on map, MRIO. 7 (11) [234 n. 3]. [9] Sometimes written D'Orville. [10] True value 21° 28′ N. [11] Wessells (173). [12] Described by Du Halde, II (138-39). [13] True values, 36° 35′; 29° 40′; 25° 37′; Clements Markham (295). [14] Wessels (196). [15] Fatehpur Sikri. [16] Herbert (23).

ruled his state from 1699 to 1743, and is the royal astronomer to whom India owes the famous observatories of Jaipur, Delhi, Muttra, Ujjain, and Benares.

A most interesting account of Jai Singh and his observatories has been written by Kaye. His observatory at Delhi, well known as the Jantar Mantar, was completed about 1724, and restored by the Maharāja of Jaipur in 1910–2[1].

The Raja had for many years made great progress...with the aid of his Brahmin experts, but the time came when he desired to test his observations with the help of European science. About 1728 he sent Father Figueredo home to Portugal for training, and received out, amongst other books, a copy of La Hire's Astronomical Tables[2]. Finding that "the position of the moon as ascertained by the observations of his astronomers differed slightly from that given in the Tables", he wrote to Chandernagore for help, and

Fathers Pons and Claude Boudier left Chandernagor on the 6th of January, 1734, stopped at Patna in the house of the Capuchins, stopped at the college at Agra, and at the Observatory of the Rajah of Delhi, and then proceeded to Jaypore, where they worked during August and September 1734[3].

Regarding the position of Jaipur, D'Anville writes,

Its latitude at the observatory in the raja's palace is 26° 56′ North; we have also an observation of the longitude given us; for by an observation of a Lunar eclipse, in the month of December 1732, made at Jaepur by the Raja's brachmans, and compared with one made at Paris, ...father Boudier concludes the difference of meridians...74° all but 6′ or 7′, and an emersion of the first satellite, observed at Jaepur by father Boudier, makes it...74° all but 15′, which agrees pretty well[4].

D'Anville records that Boudier's observation for latitude at Patna gave 25° 38′, as against 25° 44′

by Grueber, and how many essential situations are there in other parts...of India that we would be glad to find within 5 or 6 minutes of their true latitude[5].

Boudier's observations, taken on the way to Jaipur and back, and throughout his life in India, were frequently quoted[6]. Amongst Orme's papers is a list of his observations between Jaipur, Calcutta, and Balasore, "par rapport à l'observatoire royale de Paris à Jaepour[7]".

Father Noti has published a description of Jai Singh's observatory at Jaipur, as given by Tieffenthaler in 1751, and continues,

Jai Singh died in 1743...and the observatory of Jaypore soon lost its prestige. Boudier and Gabelsberger having also died, Father Ströbel was the only surviving member of the batch of European astronomers there. Two years later, 1745, Ströbel received an invitation from the Great Moghul to come to Delhi, presumably to take charge of the observatory of that city[8].

We have already referred to Father Tieffenthaler's travels and observations that were so great a contribution to geography [11]. Noti records the following passages regarding his astronomical observations;

As a rule, Tieffenthaller had at his disposal only a quadrant for latitudes, and an armillary astrolabe...for longitudes. ... In other cases he calculated the longitude by the mileage...from another place, the longitude of which was known to him. ... From time to time there occurred some phenomena in the sky, such as the occultation of one of Jupiter's moons...or a lunar eclipse. "At Goa...in 1743", he writes "on the 4th of November, at 2 p.m." I observed Mercury ...pass across the disk of the sun; but owing to the lack of instruments I was unable to watch either the ingress or the egress." He assigned Goa a latitude of 15° 10′ N. Thenceforward he kept a register of the latitudes of all places at which he was able to measure the sun's meridian altitude. This register is lost, and only about 100 values are given in his geography[9].

On 2nd February 1744, he was already at Surat, to observe the occultation of Jupiter by the moon; ... 71° 50′ E. of Greenwich. Having also measured the sun's meridian altitude, he registered for Surat a northern latitude of 21° 5′ [176 n.2].

26th April 1744, observed lunar eclipse at Damaun. ...

Latitude of Agra by altitudes of the Sun, May 1st, 2nd, 3rd, 1745; 27° 15′ N; visited Muttra to see the Observatory of Jai Singh. ... Longitude of Agra, March 7th 1747, by lunar eclipse 76° 13′ E. ... May 16th, 17th, 1747; Latitude of Delhi, 28° 25′ N. ...

[1] Kaye (46). [2] pub. 1702; Maclagan (133–4). [3] Hosten (38). [4] True position, 26° 55′ N.; 73° 30′ E. from Paris. Herbert (24). [5] ib. (28) but cf. Wess lls (196) and Clements Markham (295) [149 n.13]. [6] Souciet; Bernoulli, II (429). [7] Orme MSS. 65 (21). [8] Noti (402–3). [9] See lists in Bernoulli, I & II.

On his journey from Narwar to Bombay, 1750...he visited the astronomical observatory of the late Rajah Jey Singh [at Oojein], which consisted of only the most necessary astronomical apparatus. Making use of it, he assigned Oojein a latitude of 23° 12′[1].

Tieffenthaler's observations, however, were not accurate enough for more detailed maps, and Duperron had difficulty in assembling his maps of the Ganges and Gogra rivers [11–2] on account of his uncertainty both of the length adopted for the *coss*, and the positions of controlling stations[2].

Knowledge of the coast line of India came first from early mariners, of all nationalities, who observed their position at sea and off the coast, taking latitudes by sextant or astrolabe, following point to point along the coasts by compass bearings and "estimating" their longitudes. It will be seen from plates 3 and 16 of this volume how accurately they fixed the latitudes of the more striking coastal features, even so early as the 15th century. The most notable of these navigators was the Frenchman Après de Mannevillette, who used a Hadley's quadrant[3] as early as 1736, when it was definitely regarded as an English instrument[4] [199].

RENNELL'S MAPS OF BENGAL, 1760–77

At the middle of the 18th century latitude could be readily determined by observing the meridian altitude of sun or star, but the determination of longitude was a very different matter; observers had to wait for some favourable phenomenon, such as an eclipse of sun, moon, or Jupiter's satellites in a clear sky; the observation was then of little value unless it corresponded with a similar observation at some known place, and even then the tables available for working out results were far from correct [163]. It is therefore not surprising to find that, though Rennell and his contemporaries made frequent observations for latitude, it was but seldom that they observed for longitude. Though Rennell made use of any available observations for his detailed surveys, he mostly relied for longitude on actual measurement by ground survey.

The determination of longitude was of such importance for navigation, that the British Government had long offered a reward for some sure means of effecting it [202]. An Act of Parliament was passed as late as June 1774, offering rewards for either "a Time keeper, the Principles whereof have not hitherto been made public", or for "improved Solar and Lunar Tables"; the reward to be

£ 5,000, if such method determines the said Longitude to one Degree of a Great Circle, or Sixty Geographical Miles; ... £ 7,500, if it determines the same to Two Thirds of that Distance; and...£ 10,000, if it determine the same to one half of the said distance",

and provision was made for satisfactory tests by the "Commissioners for the discovery of the Longitude at Sea[5]" [154].

Plaisted, the first surveyor employed as such in Bengal, was, being a sailor, a skilled observer of latitudes, and on his survey of the Chittagong coast in 1760–1, used mostly observations to the sun [14].

On his survey of Verelst's march to Cāchār two years later [82], he notes on his map that "The Latitudes are taken with Headly's Quadrant by Reflection in Water and may be depended on[6]".

Rennell also, from the very beginning of his surveys, took regular observations for latitude. He further observed for the variation of his compass, often in regular sailor fashion at the close of the day when pole-star and horizon were both visible, and at other times "by y^{e} Sun's Amplitude". For his first two years he worked out his latitudes to the nearest minute only, but from 1767, to 15 seconds; he allowed for refraction at the round figure of 50 seconds[7].

He writes in his journal on December 13th 1764,

[1] Noti (147–8, 151) cf. Noti (411), & Orme MSS. 65 (10). [2] Bernoulli, II (266 *et seq.*). [3] probably an *Octant* [199]. [4] *As R.* 1800, *Characters* (46). [5] BPC. 23–12–76. [6] *Imp. Lib. M & P.* 334 C. [7] La Touche (122 & *passim*).

By an Observation of Latitude taken this day about four miles below the mouth of the Megna, I find myself in 22° 40′, and being now at least 20 miles from the Sea, it appears that the old Maps have laid down the Latitude of the Mouth of the Ganges much too far Northerly; for instance M. d'Anville places it in 22° 36′ or thereabouts, ...whereas...the...Ganges Mouth must be about 22° 20′ N.[1] [19].

At the end of 1766 Rennell had to re-survey part of the Tista because Richards had been without an "instrument for taking the Latitudes" [24]; on the other hand there is a note on the map of Midnapore by Adams and Carter,

The Latitudes and Longitudes were laid down from those of Midnapore, the former being settled for that place by more than 40 observations of the sun and different stars at 22° 25′ 9″ North, and the latter, by many observations on the Eclypses of Jupiter's Satellites, at 5^h 49^m 20^s, or 87° 20′ East from Greenwich[2].

The following is an example of the instructions Rennell gave to his surveyors;

Should you find it impracticable or extremely difficult to measure the distance between Benares & the South Boundary [35], a correct line of bearing with the difference of latitude by observation between the two places will suffice, as the direction is so nearly meridional [20]. An observation must be taken at the northern extreme of your survey, and if opportunity offers at Musanagar, Bareilly[3], and Lucknow. Azimuths or amplitudes for determining the variation of the needle should frequently be taken, and with the same instrument that you commonly take the angles with[4] [201].

In general, Rennell considered that the traverse measurements throughout his survey of Bengal agreed well with the astronomical observations[5];

The distances were measured, and they accorded with the observations of latitude and longitude; with the former minutely, and with the latter so nearly that it was unnecessary to make any correction[6].

again,

The distances in the Map were measured with all possible exactness. As a proof of it I need only mention that an arch of the Meridian containing 4 degrees so measured scarce wanted any correction. The observations of Longitudes too (which were taken previous to the commencement of the Survey) show that the difference of Longitude is generally true.

Claud Boudier...makes the longitude of Benares to be 80° 47′ E. from Paris, or from Greenwich 83° 07′,

91° 45′...Plaisted's Longitude of Islamabad[7].
8° 38′...Difference.

By mensuration the difference of Longitude between these places (which are in the extremes of the Map) is about 8° 36′; not that I would insinuate by any means that either observations of Longitude can be taken with such minute exactness, or that it is probable that the admeasurement of $8\frac{1}{2}$ degrees in the course of a general survey could be attended with so trifling an error[8].

Discussing the agreement of longitudes Dalrymple also writes,

I do not mean to insinuate that any two astronomical observations can be confided in for the determination of so small a distance as a mile[9]...

and to illustrate the wide divergence that was possible, Plaisted's value may be compared against a value for Chittagong "calculated by P. Barbier, missionaire Jésuite françois...93 degrés[10]", which would be 95° 20′ East of Greenwich.

Anquetil-Duperron wrote in 1776, possibly thinking of conditions when he was in India nearly 20 years earlier,

All the leading nations...send their trading vessels, year after year, to the mouths of the Ganges, and they are ignorant even of the exact geographical position of the otherwise well-known city of Chatigang[11] [14].

As regards latitude observations, Dalrymple writes as late as 1783,

To say that Latitudes, taken at Sea near Land, in the present state of Nautical Astronomy, cannot be depended on, at all times, to less than 5′ or 6′, will raise a sneer, ... but my own Experience long since convinced me of this: the same thing is now found by careful Observers, to whatever cause it may be owing; ... yet the Latitude is supposed to be *the Thing* which may be confidently relied on[12].

[1]ib. (34). [2]A remarkable result, true position 22° 25′ N; 87° 19′ E.; MRIO. 51 (3). [3]Musanagar, 54 N/16; Bareilly, 53 P/7. [4]BPC. 5–12–76. [5]but see indictment by Burrow [166–7]. [6]*Memoir*, 1793 (48). [7]Chittagong, 79 N/15; correct longitude, 91° 50′. [8]IO. Maps, I.AC. 13. [9]*Memoir of a Chart of the Bay of Bengal*, 16–9–72. (5). [10]Bernoulli, II (273). [11]Noti (407). [12]*Chart of the Coast of Guzarat & Scindy*, 3–9–83 (4).

Orme made a large collection of astronomical observations, including 27 latitudes which Rennell had considered sufficiently exact to "correct the general map" which Clive took home in 1767 [24]. Fifteen of these were observed by Rennell himself, two by Adams, one by Plaisted, and three by someone named Daw[1]. Others were,

Latitude and longitude of Calcutta by Captain Thomas Howe [176]. March 1764. Zenith distance by Quadrant; Longitude by Jupiter's satellites[2].

Latitude; of Cuttack and Sambulpur[3], by Mr. Mallock and Captain Alleyne [30]; ...of Lucknow by Showers, taken in 1768 or 1769 with a Quadrant of 11 inches diameter[4].

For his first *Map of Hindoostan* Rennell took the latitude of Calcutta as 22° 33′ N, and longitude as 88° 28′ E[5].

by a medium of four different gentlemen; ... Hon. Thomas Howe 88° 33′; Rev. Mr. Smith 28′; Mr. Magee [*inf.*] 24′; Capt. Ritchie 26′ [180–1].

TRANSITS OF VENUS, 1761, 69

From time to time there have been opportunities in India of observing the transit of Venus across the Sun's disc; a phenomenon which may be used for the determination of differences of longitude. In 1760, at the suggestion of the Royal Society, the Directors called for volunteers to contribute observations, and the Bengal Council reported,

In consequence of your directions...We delivered copies of the Instructions relative to the Transit of Venus to such gentlemen here as were inclined to make the observation. ... The only reports we have received are One from Mr. Plaisted taken at Chittagong, and one from Mr. Magee[6] taken here, ...but for want of proper Instruments they are not of a sufficient exactitude to be of any material use[7].

From Plaisted's observation the Astronomer Royal deduced the longitude of Islamābād 91° 45′[8] already quoted.

The chaplain, William Hirst, describes his observations of this transit, made on June 6th 1761 at Madras in company with the Governor, Lord Pigot [143 n. 8], and the Chief Engineer, John Call, and tells how he

begged Mr. Call to take notice of the Penumbra, ''tis a 'coming'. All three observers pronounced contact with one voice[9] [169].

In 1768 the Directors sent out a similar request, saying that observations of the expected transit

will afford the only means of ascertaining some of the principal and hitherto unknown elements in Astronomy, and of improving both Geography and Navigation. ... Recommend to such of the Company's servants at Madras, Bombay, Bencoolen[10]...as have been accustomed to Astronomical observation to prepare for, and exert themselves in this. ... Instruments required,

1. Reflecting Telescope. 2 ft. focus, with apparatus of smoked glasses.
2. A Pendulum Clock.
3. An Astronomical Quadrant, of 1 ft. radius at least, or in lieu of it, an Equal-Altitude Instrument[11].

De Gloss [27], now employed at his gunfoundry at Dinapore, observed this transit with the aid of his assistants, using three quadrants, taking also the Sun's altitude, with the hour "exactly corrected and all the allowances made[12]". Observers at Madras were not so successful, the Council reporting,

The Instruments which your Honors sent for observing the Transit of Venus having arrived in time, Mr. Call with the assistance of the other Engineers undertook to adjust every preparative for an accurate observation; but after taking great pains to regulate the time-keeper, and adjust the Instruments, the expected Observation was entirely frustrated by a change of weather coming on the 3rd June, which occasioned so cloudy a morning on the 4th,

[1] Orme MSS. XI. [2] ib. 67 (123). [3] ib. 67 (138). [4] ib. 8 (3). [5] *Memoir*, 1783 (20); True values, 22° 34′ N., 88° 22′ E. [6] William Magee, Notary Public, Calcutta. [7] B to CD. 1–11–61 (131). [8] Dalrymple, *Memoir of a Chart of the Bay of Bengal* (5). [9] *Phil Trans.* (lii) 1761 (396). [10] Company's station on SW. coast of Sumatra; exchanged later for Dutch settlements in India. [11] CD to B.16–3–68. [12] *Phil. Trans.* LX. 239 & BPC. 24–1–69.

that the Sun was not visible till 10 o'clock; the same ill success attended Monsr. Gentil [180 n. 3] sent purposely the year before from France to Pondicherry, and Mr. Stevens [92] who had fitted an apparatus at Masulipatam was equally disappointed.

The Instruments for Bombay could not possibly be sent thither in time[1].

SMITH, PEARSE, AND OTHERS

There were always several of the Company's servants who were interested enough to take astronomical observations for their private amusement, and thus help the great cause of geography.

We have already noticed Thomas Howe, Captain of an East Indiaman; William Magee, Notary public; and the Reverend William Hirst who came out as a Naval Chaplain; but the most notable of all the astronomers on the Bengal side were the Reverend William Smith, and Thomas Deane Pearse of the Artillery.

Smith came to Calcutta as a private tutor, not in the Company's employ; he was an enthusiastic astronomer, who laid claim to the British Government reward [151] with his "*Short and correct method of determining the Longitude at sea, by a single altitude of the Moon*", and it was on account of his known skill as astronomer that he was selected to accompany Upton's mission to Poona in 1775 [30–1],

to survey the country...in the most accurate manner he can, and by astronomical observations to ascertain the exact situations of the places[2].

In his journal Smith devotes a full section to his astronomical observations;

The...Astronomical part is indeed the basis...with respect to the situation of places, for this determines the Latitude and Longitude of each. ... Eclipses of Jupiter's satellites, ... occultations of stars by the moon, observed with $3\frac{1}{2}$ ft. telescope by Dolland. ... Latitudes from meridian altitudes of stars, some North, some South of the Zenith [200], also of Sun and Pole Star; which frequently gave the true Latitude within less than $\frac{1}{4}$ of a mile, and ascertained the error of the Quadrant within a few seconds.

Before the mission started he recorded

meridian altitudes taken at Benares, September 20th to 23rd. I requested Captain Thomas Carter to take a set of altitudes with *his* quadrant, not much unlike mine [200]...which he took at a spot 200 yards from me. Longitude of Benares, found $5^h\ 32^m\ 56^s$, or 83° 14′ East from Greenwich, by Jupiter's Satellites[3].

Smith's line, run across the centre of India, was of particular value from the regularity and care with which the astronomical observations were taken [31] and Rennell points out that between Kālpi and Sironj[4], an interval of about 2 degrees, the difference of longitude as measured by Goddard's surveyor exceeds that observed by Smith by only four minutes[5].

Before his return to England two years later Smith was able to observe latitudes at Bombay, Cochin and Calcutta [153].

Pearse commanded the Artillery in Bengal from 1768; he was an enthusiastic astronomer, and established an observatory at his private quarters at the Treasury Gate, Fort William, where he made regular astronomical and meteorological observations. A continuous series of his observations for latitude and longitude, from 1774 to 1779, was published in *Asiatic Researches* with a detailed description of all his instruments and apparatus. From his observations of Jupiter's satellites and lunar eclipses, he deduced a mean longitude for Fort William of 88° 22′ 07″, and from the altitude of 18 different stars observed with an 18-inch quadrant in 1776, he made the latitude 22° 33′ 10″·55[6] [153 n. 5].

The Mysore War of 1781–4 gave him further opportunity of prosecuting his hobby during his famous marches to and from Madras [40–2]. During these journeys Pearse not only had the route traversed, but made a series of astronomical observations fixing the position of practically every important place along the coast,

[1] M to CD. 27–6–69 (63). [2] BS & F. 24–7–75. [3] True value 83°.01′; BM. Addl. MSS. 29213. [4] 54 N/16, 54 H/12. [5] *Memoir*, 1783 (24–5). [6] *As R.* I 1784. (57–80).

with many intermediate ones[1], whilst an almost greater contribution to geography was the training of his young assistant, Robert Colebrooke, to become an accurate observer and enthusiastic surveyor.

In various reports he writes,

In these hot climates the stars only can be employed, for the *Sun's* heat at noon, after a long march, is really not to be borne by any constitution[2]. ...

The latitudes were daily observed, and the result is entered on the tables. From the difference of latitude of the places where the satellites were observed, and the easting and westing of that place with respect to Madras taken from the tables, I calculated the angular difference of longitude which, added to the longitude of Madras, gives the longitude of the place by survey. The differences are such as must happen, because the satellites, observed with every degree of attention, will give different longitudes for the same place; and these differences will sometimes amount to 10 or 12 minutes of a degree, but the differences on this survey are all less[3]. ...

The difference of longitude between Madras and Fort William, derived from the reduced measure by the wheel and that calculated by observations of Jupiter's Satellites, differed... not quite five geographical minutes[4].

Regarding the longitudes he further notes that

Ichappor, Madras, Nellore, Peddapor[5] and Calcutta were observed by myself. Vizagapatam once by me, and once by Mr. Maxtone, ... and all the rest by Lieutenant Colebrooke[6].

Of the longitudes at Vizagapatam;

October 3rd 1782[7]. ... The time was shewn by Mr. Russell's time-keeper, which was made by Arnold, and was regulated by the meridian line in his hall. ...

October 23rd. Emersion of Jupiter's 1st Satellite by Mr. Maxtone; ... Watch corrected by Mr. Russell's meridian line[8].

Most officers surveying marches of troops made observations of latitude to the best of their ability, but this is not always definitely stated in their records. There is, for instance, no record of such observations along the survey of Goddard's route, though it is hardly likely that skilled surveyors such as Caldwell and Stewart would have failed to make them. On the other hand, for the return of the detachment in 1784, although the journals give no dates nor particulars of any survey, nor any surveyor's name, yet there are records of occasional observations of latitude by sextant; in fact the latitude of Handia[9], on the Narbada was observed as 22° 25′ by one sextant, and 22° 22′ by another[10].

A surveyor of high class was Ewart, formerly an officer of the Bombay Marine [42]. In his survey to Nāgpur in 1781–82, he recorded his perambulator distances without bearings, but observed latitude to the nearest half minute every two or three days[11].

The British Museum has a series of his astronomical observations taken between 1778 and 1781 and worked out on printed forms. For the first two years these were taken on board ship, but were afterwards continued at various stations in Bengal [161]. He observed longitudes by lunar distances when at sea, but on land turned to the satellites of Jupiter; latitudes were taken with a sextant of six inch radius by Ramsden, generally the mean of five sights. There is a note that,

Altitudes of observations taken on shore were all by reflection in oil, and the correction of the watch mostly by Equal altitudes of the sun and stars[12].

REUBEN BURROW, 1783–9

In 1783 there arrived in Calcutta a most remarkable and talented man, Reuben Burrow, mathematician and astronomer, already aged 35 years. He had at one time been assistant to Maskelyne, the Astronomer Royal[13], and then for six years

[1] Full details, *As R.* I. (81–121) & Colebrooke's Journals, DDn. 2 & 4. [2] *As R.* I (86). [3] *Ben. P & P.* VI. 281, 27-1-85. [4] ib. VII, 120. [5] Ichchāpuram, 74 A/12; Nellore, 57 N/15; Pithāpuram, 65 K/4. [6] BPC. 28-1-85. [7] During return from leave in Bengal, in charge of treasure [199]. [8] *As R.* I (91). [9] 55 B/15. [10] Journal, MRIO. M. 207. [11] Journal, MRIO. M. 229. [12] BM. Addl. MSS. 29210 (352 *et seq.*). [13] Nevil Maskelyne. b. 6-10-32; ed. Westminster; Ordained 1755; AR. 1765 till d. 1811; *DNB. Ency. Brit.*

mathematical master to the Artillery cadets at the Tower of London[1]; in which capacity he had been employed by the Board of Ordnance to make a survey of the coast of Essex and Suffolk, and also of the Woolwich Warren. His salary at the Tower was only £ 100 a year and, getting no extra allowances whilst on these surveys, he fell out with his principals. At the suggestion of Henry Watson, Chief Engineer at Fort William, he came out to Calcutta to pick up what work he could, and to follow up a scheme for studying the mathematical systems of the Hindus.

He at once interested himself in Hindu astronomy and was most anxious to be sent up to Benares to get into touch with the pundits there. The following extracts from an address he submitted to Warren Hastings gives the substance of his proposals;

The Information which has now obtained with regard to the ancient Literature of the Hindoos renders the preservation of its remains an object perhaps the most interesting of any to the Learned world.

M. Gentil [180 n. 3] in 1772 brought with him from the Coast of Coromandel Astronomical Tables of the Bramins of Trivalour. ... It is certain that in Bengal there is a mean profession of people, who annually compile almanacks from ancient Tables and calculate eclipses with considerable exactness, but are altogether ignorant of the principles on which their calculations depend. ...

It is humbly suggested, therefore, that it is an object worthy of our monarch, the Sovereign of the Banks of the Ganges, ... to give such directions as may be necessary for discovering & translating whatever is extant of the ancient works of the Hindoos. ... The Astronomical Tables used in Bengal must be easily procured and, it is hoped, some treatises in the Shanscrit relative to them[2].

He then goes on to recommend a regular astronomical survey to serve as foundation for the geography of India, shewing but scant appreciation of the labours of earlier surveyors;

The Surveys of India are known to be remarkably defective, & there is great reason to believe that not a single place in India has had its Longitude properly determined except Pondicherry. The Latitudes are nearly in the same predicament, and indeed most of the English maps are made up of ideal chains of mountains & imaginary woods, taken piecemeal by pretended surveyors, & put together at random without either Longitude or Latitude, by people who were only solicitous to have a fine drawing, without any regard to exactness or to use; by these means the countries are horribly distorted in their positions, and Geography is so little benefitted by such maps that they are a nuisance rather than an advantage, and there is no other proper method of correcting such surveys but by determining the positions of some of the most material points by Astronomical Observations; this would assist in putting the different surveys together; and as the Longitude of Benares, and others that might be deduced from it, would contribute in part to that purpose, a journey thither of course would be so far useful.

The opportunity of making Observations of the dip and variation of the compass might have their utility, not only in correcting the surveys, but in discovering the theory of magnetism. ... The nature of the Refraction and its variation with respect to the heat, moisture, and density of the air, would also be a very proper object of enquiry at Benares. ...

If the observer were furnished with a proper instrument it would also be advisable to find the moon's horizontal parallax; ... this would in some respects answer the purpose of measuring a degree of the meridian, especially as the errors might be reduced to very small limits by a repetition of the observations; and this method has an advantage over that of measuring a degree, for it is not liable to be affected by the uncertain attraction of mountains.

If it was though proper to send a person who was well acquainted with the theory and practice of Astronomy etc. with a small collection of good Instruments, to take the Latitudes and Longitudes of most of the particular towns and places in the Company's Territories and dependencies, he might not only collect materials for making a proper survey of those parts, and acquire information respecting the ancient and modern state of the country etc., but would also have an apportunity of making the best Collection of Astronomical and Physical Observations that has yet been offered to the Public; and if it was thought that umbrage might be taken at such a procedure by the natives, it might easily pass under the notion of measuring degrees of the meridian, or of Longitudes etc., to avoid suspicion[3].

[1] Absorbed into RMA., 1782. *v.* Bio. Notes, *sv.* Burrow. [2] BM. Addl. MSS. 29233 (237). [3] *ib.* (274).

In another letter he presses the advantages of making astronomical observations at Benares;

Fortunately for Astronomy there is a large Quadrant existing at Benares [150], which from the intent of its construction must necessarily have been placed in the plane of the meridian when the Observatory was erected, ... and as this Quadrant is an immoveable structure of solid masonry...the transits and Altitudes of a number of stars may be taken with it, by a proper contrivance [1].

No immediate action was taken on these proposals; Warren Hastings who appears to have been interested left India early in 1785, and his successor was at once occupied in schemes of retrenchment and economy. It was not until 1787 that Burrow's scheme could be put into action. In the mean time early in 1784, he was, on Watson's recommendation, appointed mathematical master to the Engineer officers at Fort William [270]. In pressing the need for the instruction of these officers in astronomy, Watson had obviously strong grounds for writing,

The very great want of Astronomical knowledge in the Surveyors who have been employed by this Government has occasioned many repetitions of the same Survey, and great additional Expence has in consequence been incurred. I will therefore venture to pronounce that expensive Repetition must be continued, till a sufficient Number of Gentlemen of the Corps of Engineers are able to ascertain the Limits of their Surveys by Astronomical Observations[2].

This dissatisfaction was shared by Call, on whose recommendation Burrow was appointed to carry out an astronomical survey such as he had first suggested. Burrow writes;

Some time about the commencement of the year 1787, Colonel Call (who had been Surveyor General & was then Chief Engineer) informed me that in constructing the New Map of India he had found so many contradictions and absurdities in the various Surveys, and so much difficulty in adjusting the places and principal positions of the different districts, that he was convinced of the incorrectness of the most considerable Latitudes and Longitudes; and therefore requested that I would consider the subject, and draw up a plan for determining their situations astronomically; with an estimate of the time it would take to be executed.

The intention was to fix the positions of the principal places in the Ganges and Burrampootra Rivers; from the Hardwar, where the first leaves the mountains of Sirinagar, to the mouth of the Hoogly; and the second from Goalpara on the boundary of Assam, to the conflux of the Megna with the Bay of Bengal; also the Coasts of Coromandel & Malabar, from Point Palmyras to Bombay; but as the most considerable difficulty was the adaptation of the business to the proper seasons of the year, so as to suffer the least impediment from the rains and changes of the Monsoons, etc., I not only took considerable pains in forming a plan for the purpose myself, but also submitted it to the opinions of Colonel Pearse and others; and on this plan...it was supposed that the business might be finished in two years.

The business was recommended to Government by Col. Pearse and Col. Call, & approved of; but the Surveyor General (Major Wood) having considered it (though an astronomical business) as in some respects under his department, applied for, and procured, the superintendence of it; and in consequence I received a plan from him which differed most essentially from my own; with particular orders from the Government to obey Major Wood's instructions[3].

These instructions were dated June 23rd 1787,

two years being allowed to you for the finishing of this work. ... For the present you are not to proceed higher up the River than Patna. ... You are afterwards to return to the Coastward, and having fixed the latitude and longitude of Dacca, Goalpara and Chittagong, you will be pleased...to return to Calcutta...by the beginning of December, for the purpose of ascertaining the exact situation of the Southmost extreme of the Island of Sagor[4] and Point Palmiras. ... Your being able to execute this service so early in the Season will greatly facilitate your progress along the Coast of Coromandel and Malabar, to which latter it will be necessary you should...have finished your observations by the middle of April, as after that period it is not only dangerous but difficult for vessels to Navigate that Coast. ...

From Cape Comorin you will proceed to Goa, Bombay, Surat and Diu[5].

On your return to Calcutta you will receive further instructions respecting...places to the Northward of Patna. ... Ensign Blunt, of the Corps of Engineers, will accompany you on this service, for the success of which you have my best wishes[6].

[1] BM. Addl. MSS. 29159 (376). [2] BPC. 1-12-83. [3] Journal, IO. Maps, MS. (5). [4] Sāgar I, 79 C/2. [5] Diu I. 41 L/14. [6] BMC. 23-6-87.

Government passed a bill for the following instruments which Burrow managed to collect in Calcutta[1] [204],

1 Arnold's Chronometer	Sicca Rupees		1000	1 Marine Barometer & Thermometer	Sicca Rupees		140
1 „ Large Time piece	„	„	700	1 Astronomical Quadrant	„	„	200
1 15-inch Brass Sextant	„	„	250	1 Dolland's Achromatic Telescope	„	„	360

and they wrote home,

That we might the more effectually comply with your instructions for ascertaining the position of the Principal Places in India, we determined to employ Mr. Reuben Burrow, a very able Mathematician & Astronomer, to ascertain the Latitudes and Longitudes of several places, as well on the Coasts as in the interior parts of India, by accurate Astronomical Observations. He is to have an addition of Rs. 500 to his Salary during the time of his being so employed, which we imagine will not exceed 3 years.

He is to be accompanied by Ensign Blunt, of the Corps of Engineers, to whom we have granted an allowance of Rs. 200 a month. Copy of Instructions to Mr. Burrow is enclosed[2].

Burrow started up the river in July 1787;

I arrived at Nuddeah[3], a famous university of Bramins, the 23rd July, and from observations made on an artificial mound at the North East part of the town, where the Cossimbazar river joins with the Jellingy, I found the Latitude, from 8 stars (4 north & 4 south) to be 23° 25′ 49″ and the Longitude to be $5^h\ 53^m\ 18^s$.

His programme both up and down the river was interfered with by bad weather;

This shews how necessary a proper consideration of the seasons is in every plan for conducting a business of this nature in such a climate as India; and how little it had been considered in that I was ordered to follow.

On this account he had to abandon observations at many important stations, and leave them to the following year; on the other hand,

I took many places that were not in my orders, but as I made a particular point of losing no time by it, & did the business at night when the boatmen were asleep, it could not have the least effect in retarding any of the observations of the Surveyor General's Plan.

Leaving Patna for his return journey about September 25th, he made his way down the Ganges to Dacca where he arrived on October 29th,

and found the place full of sickness and infection; the people were dying by heaps, and we were immediately almost all taken sick; ... my assistant [Blunt] too was so very ill that he was totally unable to proceed, and, to add to our misfortunes, we had forgot to wind the watches up, so that I was under a necessity of staying longer at Dacca than I otherwise should have done.

Having had many observations to make; the rates of the watches to find anew; stormy weather; a horrid fever and nothing to take for it but some James's powder, which on examination I found to be counterfeit, I could not get away from Dacca before the 5th November; I had doubled the number of my boatmen, and provided as well as I could to encounter the rapid current of the Burrampooter; and on the 6th I got into the Luckia Nullah [209 n. 6] with the gout in both feet, stomach, and head at the same time. I lost some observations by my illness but no time, for I had taken an European sailor to oversee the people; and to get out of the infectious air of Dacca was an additional motive for expedition. I was not, however, able to observe till the 14th of November, & even then I was obliged to be carried by my servants, and supported in such positions as the Observations required[4]. All this might totally have been avoided had the plan I proposed been a little attended to in forming my instructions.

The expedition up the Brahmaputra was one long toil and trouble;

Being ill all night with the Gout, I slept a little in the morning, and did not for some time keep the account. ... The river is so full of islands, and we are driven so irregularly by the stream, and what angles I take I am obliged to do in bed on account of the Gout, so that few things of any consequence can be got. ...

Sent a man to buy milk & above 20 people ran out with bamboos to kill him. All the way from Dacca to here, nobody will sell anything. ...

Killed a Herreal Snake as green as grass; it was a yard long, and $\frac{1}{4}$ of an inch in diameter at the thickest part; it took 18 blows to kill it, and was tougher than leather; its mouth was an inch long; they are very deadly and it is difficult to distinguish them from a blade of long grass [19]. ...

[1] BS & M. 16–7–87. [2] B to CD. 16–8–87 (100). [3] Nadia, 79 A/7. [4] cf. George Everest on Great Arc, 1824.

The country has almost been destroyed by floods; a most wretched object, who evidently was not a fakir, came to beg, and said that he had 5 children starving to death, & one of them at that instant dying; there was such horror in his look & behaviour, and such astonishment when I gave him a rupee, that I had no doubt of the truth of what he said; indeed we were almost starved ourselves, as we could buy nothing whatever & had only a little wheat left. ...

I saw for the first time two of the enormous tops of the Bootan hills peeping over the clouds; they were nearly in the form above but rather indistinct [sketch with bearings]. ...

In going round this sand I had nearly lost my boat; it was filling with water and would have sunk in a second or two, if I had not cut the rope & let the boat drive down the river; it took me till $23^h\ 40^m$ before I got to the same sand again ($2^h\ 8^m$), and then it was with great difficulty that the place was passed. ...

Near this place was a town called Cursakatty, and as we were starving we endeavoured to get something; but the people were starved out, except 2 or 3 families, & there was nothing to be got except a tame sheep which they would not sell, tho' we offered more than thrice its value; we got it however, partly by force and partly by offering them some salt, which they prized at a much higher rate than money. ...

With respect to *Geographical Observations* all that could be done was to substitute the time for a measure of the space, and to estimate the rate per hour in the manner of traverse sailing, and to take such bearings and make such remarks as occurred. As my assistant left me in a very short time on account of sickness, & I was totally alone ever after, not only so but sick a considerable time myself, ... it will appear, I hope, that as much was done as could be expected from a person who was mostly up a considerable part of the night making astronomical observations, and of course the less able to apply in the day.

[Many coloured sketches of the little wooded hills along the river].

When I got to Goalparah I immediately sent a letter to the person that had charge of the factory informing him of my business &c., but he returned the letter unopened & threatened to shoot the man that brought it: I next morning went to the factory myself, but he refused to see me, & stopped the Bazar all the time I stayed; so that both myself & the people with me were almost starved to death, and one of the men actually died about two hours after I left the place: ... At a point where I wished to observe some angles he had planted a guard of Sepoys, with orders, as they said, to fire upon me if I attempted it. The name of the person is Daniel Rausch [80].

Rausch later explained his conduct by alleging that he thought Burrow was a sherriff's officer come from Calcutta to arrest him[1]. To proceed with the journal,

I stayed 6 days at Goalpara, and besides a number of distances & other observations, I got four Eclipses of Jupiter's Satellites; I arrived there the 1st December, and it was on account of two eclipses happening the 5th that I stayed so long.

Latitude of Factory at Goalpara 26° 11′ 21″; Longitude, $6^h\ 2^m\ 9^s.2$. ...

After returning as far as Luckypore in the Megna[3], I found that proceeding from thence to Chittagong would not only be dangerous in such a vessel as mine, but would also make it too late for me to go round the Coast, & proceeded with the utmost expedition through the Sunderbuns to Calcutta. ...

Stopped as the tide ran strong against us and the people were tired; this is a beautiful river, very like the Stour near Ipswich. Set off again very ill. I had purchased some Turtle at Cowcally[4] and everyone that ate of them were poisoned. I had been growing worse and worse and now was unable to keep any account. ...

At this time my illness increased so much that it was only at intervals that I could keep the account, and therefore I shall insert no more of it: I got the latitude of a place in the Sunderbuns where there is a Bazar which the natives called Bossuntpore (but which Mr. Henkel[5] who cleared a little of the jungle in the Sunderbuns called Henkelgunge[6]) and found it to be 22° 27′ 21″, but as its Longitude is doubtful I shall not now insert it. ...

I arrived at Calcutta the 3rd January 1788, and immediately sent notice of my arrival to the Surveyor General, Mr. Mark Wood, but found no vessel provided to go round the Coast[7].

Burrow's letter to the Surveyor General runs,

To make several of my Astronomical observations of use, it will now be necessary to get the rates of the time-pieces, which will take a week or ten days. I therefore take the liberty to propose that in the meantime a small Pilot Vessel may be got ready that I may set off with all expedition to take Sagor Island, and either go to Chittagong first and then round the

[1] BPC 11-2-88 (14), & DDn. 16 (1), 5-1-88. [2] True position, 26° 55′ N.; $6^h\ 2\frac{1}{2}^m$ E. [3] Lakshmipur, 79 J/13. [4] or Charcolly, 79 F/14. [5] Collector, Jessore, 1786–9. [6] 79 B/15. [7] Journal, IO. Maps. MS. 5.

coast to Bombay, or else go round the coast first and afterwards take Chittagong. ... In the meantime I can employ what leisure hours I may have on Board the ship, in calculating the observations that I have already made[1].

These plans were, however, broken off, as Burrow received orders direct from the Governor General to board a ship bound for the island of Cheduba off the coast of Aracan;

Some people had given information...that some Europeans had been seen on the Island of Cheduba, who were supposed to have been shipwrecked. ... On the 12th January I received orders from Lord Cornwallis, ... "to report on the inhabitants and produce etc. of the island. The instruments in your possession will furnish the means of ascertaining the longitude of the island, the exact latitude of the northern and southern extremities, the passage between it and the main coast of Arracan etc. ... Return by the end of March, and furnish me with a narrative of your proceedings containing every observation & remark that has occurred to you"[2].

On his return from this interesting survey it was too late to take up the project of a voyage round the coast to Bombay, and Burrow remained in Calcutta until, at the end of the rains, he was able to start on his second expedition up the Ganges. On this occasion and during his many years residence in Calcutta, he took regular observations for latitude and longitude at his house at Russapugla [180].

Before describing this second expedition it will be interesting to note the response of the Directors on hearing of Burrow's appointment. In the first place they cannot believe that Rennell's survey in Bengal requires improvement or correction [164];

We approve of your employing Mr. Reuben Burrow, but we are sorry to see that he was mean to be employed in the Bengal Province, as we are perfectly satisfied that the positions assigned to Major Rennell's survey, which is already published, are determined with sufficient precision for any purpose.

They point out that it will not be necessary for him to survey down the east coast where Topping is working [102], whilst the Bombay Government has put in hand a survey of the Malabar coast [124];

It would indeed be of the utmost consequence to have the *actual* and *relative* positions of *Calcutta, Fort St. George,* and *Bombay, precisely* determined; we therefore recommend, if the timekeepers with which Mr. Burrow is supplied go uniformly, that his first operation be to determine the *relative* positions before-mentioned, ... losing no time between settlement and settlement unnecessarily, as the more speedily he passes from the one to the other, the more precisely will the relative positions be determined[3].

But as we have seen, Burrow's sea-trip to Bombay was abandoned.

His journal is by no means continuous, and gives no account of his journey up the Ganges in the autumn of 1788; he observed at Bankipore, Oct. 8th, Benares Oct. 29th, Allahābād Nov. 12th, Cawnpore Nov. 27th to 30th, and at certain stations which he had omitted the previous year[4].

He takes up his narrative in December and describes his land journey across Rohilkhand, from Fatehgarh[5] to Hardwār and back, moving with camel transport. Passing through "Khyrpore, ... Fereedpore, ... Bareily, ... Nabobgunge, he reached Phillibeat[6]" on January 6th 1789.

Visited the Rajah at Rampur. ... Before I left the place he came again & brought two mathematicians with him. ... They seemed to know the Ptolemaic system better than I had expected, and had read some part of the Almagest [148]; they wanted to know my business, and I told them that I wanted to compare the present latitudes and longitudes of the different places in India with the former ones, to determine if possible how much the pole of the earth has changed its place upon the surface. They said that on the Ptolemaic System the pole could not alter at all; but Faizullah Cawn said he had a book containing many Latitudes and Longitudes, which he would make me a present of, if I would accept it; and accordingly he sent me a very good copy of the Ayen Akbary [133 n.3]. ...

As my money was here nearly spent, I was under a necessity of going to Anopshere[7] to get a fresh supply, & therefore after having determined this position I left a Pundit here to search for Books of Science &c. in the Sanscrit, & proceeded towards Anopshere.

[1] DDn. 16 (1–4), 5–1–88. [2] IO. Maps MS (5); Journal contains a long & interesting description of his survey, and of the people [298], with sketches of Cheduba (85 F/9). [3] CD to B. 20–8–88 (16). [4] *As. R.* II (485). [5] 54 M/11. [6] Farīdpur, 53 P/12; Nawābganj, 53 P/10; Pīlībhīt, 53 P/14. [7] Anupshahr, 53 L/7.

Moradabad, January 14th. ... I found the camp almost totally without money, but with some difficulty got a sufficiency for the Sepoys, and then returned to Moradabad, ... then set off with an intention to cross the Country to Cossipore [1], as Rennell's map of all that part is almost totally empty. ...

Cossipore. ... I also met with some Bramins that came from the Hills, & particularly an Astronomer who seemed to be a much abler man than they usually are in the lower parts of India: he showed me several books and instruments, & promised to let me have copies; but when I afterwards sent for them, I found them almost all spoiled by the knavery of the transcribers, who had left pieces out and copied badly &c.; ... he told me there were many Astronomers among the hills.

I also procured a Map of the World made by the Bramins, & saw immediately from it what all the European world have for hundreds of years been puzzling themselves about; namely, the seat of paradise and the four sacred rivers.

After visiting Hardwār [77]; Burrow then returned via Asophghur reaching Mandāwar [2] on February 10th.

From here I sent my Pandits to the hills to get routes &c., and to bring such books and papers as I had been promised by an astronomer that I met with near Cossipore. ... Got to the old station at Anopshere, February 17th. I was taken ill of the gout almost directly on my arrival and was totally incapable of doing anything for four days.

As I knew that Colonel Wood had no intention that I should go round the Coast, and that I should certainly die if I stayed at Calcutta, I got leave to go up the country on account of my health, but at the same time I had taken every precaution for returning by dawk upon the first notice, as I wished very much to have gone round the Coast on account of its utility; as I found however, from the best information my friends could give me, that I might give up all hopes of it, I thought it would be best to get leave from Scindia to go at least through the Dooab [55 n. 2] and if possible through the Mahratta Country; also to Surat & Bombay, and so round the Coast; the times happened then to be uncommonly favourable, for Timur Shah had then a large army on the march, & Scindia wished to oblige the English. ...

I did not stay further for leave but immediately set off for Delhi, but was stopped in the very beginning of my journey by an order from Calcutta to return to the Presidency immediately; it was not without the utmost regret that I gave up an opportunity that seldom may happen again, and returned to Anopsheer; I might have gone down by water, but thought it would be of more advantage to the Geography of India to go by land as far as Futtyghur, though it was much more expensive to myself. Whilst I was at Anopsheer my Pundits arrived from the hills and brought several routes to the Comow Hills, Badrinaut [3], &c., with several books that I had bespoken. ...

February 25th. Got to the town of Bunneah, a small village inhabited by thieves and surrounded with Bamboos & jungle; I sent for their Chief and he said they never robbed near home but always at a distance; there was also an army of Fakeers and some, either of them or the thieves, made some attempts to steal in the night, but we discovered them.

The night was rainy so that I got nothing but the meridian altitudes of 4 stars for the latitude. ...

Arrived at Futtygurh March 1st 1789. ...

I have already mentioned that I was not permitted to follow my own plan, & I now repeat that I am perfectly convinced that had I been permitted to follow it, every thing I proposed to do would have been done in the time I mentioned. The journey through Rohilcund to the Hardwar in the two months of January and February 1789 was no part of Colonel Wood's plan, but merely intended for a change of air on account of sickness, in consequence of leave from Lord Cornwallis, & I took advantage of the opportunity.

Burrow then travelled down the river by water;

In my way from the Hardwar in 1789, I made some observations at Patna. ... The Latitude I found to be 25° 36′ 03″ [149, 150], and the Longitude by 25 sets of distances of the Moon from the Sun and Stars, was $5^h\ 41^m\ 02^s$ [163]. ... These determinations differ very considerably from those found by Lieut. Ewart [155], but there can be no question of their exactness.

Burrow had already observed on the *gola* at Bankipore [4] in 1787, and Garstin writes that he

determined the Longitude of the Granary at Bankipoor, from the mean of upwards of 100 observations, whilst residing with me at Patna, and took nearly as much pains with the others [5].

[1] Kāshipur, 53 K/16. [2] 53 K/3. [3] Kumaun Hills, 53 O; Badrīnāth, 53 N/6. [4] 72 G/2. [5] DDn. 126 (138), 29–4–1812.

He stopped again at Colgong[1] and observed a second time at Cleveland's bungalow, and also "determined the positions of the famous passes of Sacrigully and Telliagurry[2]" [25 n. 2].

He had an uncomfortable night further down the river;

I endeavoured to determine the situation of Bogwangola[3] in 1787, but the weather made it impracticable, and therefore in my return from the Hardwar in 1789 I wished particularly to determine it, in order to fix the position of Muxabad[4] near by it. I stopped at the mouth of the Culcully Nullah which was then nearly dry, and had just secured my boats and taken a few altitudes of the Sun, when an enormous black cloud of dust was observed at a distance, that had a most tremendous appearance, & seemed to ascend perpendicularly to the sky; soon after it came driving from the west with inconceivable violence, and the steep banks of the river began a falling on all sides, and several large vessels were sunk and overwhelmed in an instant. The storm continued near an hour and a half in the same direction, and then turned slowly towards the north and it rained a little, but without the least abatement of its violence: about 9 at night the wind came to the Southward and its force abated gradually; but the whole night was so bad that I only got a single meridian altitude, so that the latitude may be perhaps $\frac{1}{2}$ or $\frac{1}{3}$rd of a minute doubtful: the longitudes by the watches must however be pretty exact as the Altitudes were good for time, and the run between Rajmahl & Bogwangola short.

He reached Calcutta on May 12th, and reported direct to the Government Secretary;

I last night arrived at Russahpugly[5], and shall do myself the Honor to wait on the Governor General the first levée day.

Burrow's recall was probably due to the receipt of a letter from the Directors that is dealt with later [164]; anyhow he spent the rest of the year 1789 in working up his observations and results, which were published in *Asiatic Researches*[6]. The following extracts from his journal and published notes tell of his methods;

With respect to the method of making observations, I at first found much greater difficulty than Observers in Europe would suspect; Water ascends in Mist and Clouds, every glass covering with dew in an instant, and quicksilver is worse disturbed by insects than by wind: I tried several glass roofs and artificial horizons, particularly those of the circular kind in the nature of a spirit level, but found them all erroneous; after several trials...I at last accidently thought of covering the quicksilver with a muscato[7] curtain, by means of a frame made of two parallel semicircles with their convexities upwards, & fastened to the sides of a parallelogramick board, in which was a part cut out to receve the shallow trough that contained the quicksilver, which stood independent of the cover, and usually upon another piece of muscato curtain, to prevent the sandflies and other minute insects from getting to the quicksilver; this method I found to answer beyond my expectation for the Latitudes and Altitudes. ...

The errors of the Sextants are so numerous that it would require a volume to print them out. ... I think it may confidently be asserted that the errors usually attributed to the Lunar Tables are much oftner owing to the imperfection of the Instruments, & that the rewards held forth by the Board of Longitude for the improvement of the first, might be much more usefully employed in encouraging ingenious artist to perfect the latter [151].

After making the observations as carefully as I could, and allowing for the errors already hinted at, I deduced the latitudes and time &c., and generally got the rates of the watches as often as possible in order to get the differences of longitudes between each place as correct as possible I could; ... having thus found the Longitude of any particular place nearly by the watches, I then deduced it from calculations of the [Lunar] distances, as well as from eclipses of the Satellites, and taking a proper medium, I applied to successive differences at each place found by the watches, and so proceeded...till I came to some particular place pitched upon as an extreme. ...

On my return to Calcutta I found the watches had all altered their rates very considerably, & I observe that these changes are generally very sudden, & usually when the weather changes much and is damp. ...

There is no Observatory nor Astronomers in India to make corresponding observations. This deficiency would have been remedied had Mr. Hastings stayed a little longer in India, for on representing the advantages of such an institution to him, he approved of it immediately,

[1] 72 O/3. [2] Journal, IO. Maps, MS. 5. [3] Bhagwāngola. 78 D/7. [4] Murshidābād, the capital of Bengal till 1772. [5] A suburb of South Calcutta. [6] *As. R.* II, 1790 (*473 et seq*); ib. IV, 1795 (*325 et seq*). He continued regular obsns. at "Russahpughly" till end of March 1790 [180]. [7] Mosquito.

and desired that Colonel Watson would give an estimate of the expence of an observatory; this however was delayed until Mr. Hastings left the country, and all my attempts to revive it afterwards were inneffectual [171]. ...

The latitudes were generally determined from both North and South meridian altitudes of Stars, sometimes to the number 20 or 30, and seldom fewer than 5 or 6. ... I think few latitudes can be out so much as 10 seconds, and a very considerable part of them not half the quantity[1]. ...

I believe very few of the...latitudes can be more than 3 seconds wrong, perhaps not many of them so much, as the single observations with the sextant seldom differ from one another more than 15 or 20 seconds and very often not half the number. As to the longitudes it is possible there may in some cases be an error of two or three miles, but I can scarce believe there is any great probability of it, as the Observations were made, as well as calculated, in a different and more exact manner than is generally used at present[2].

The Directors showed no sympathy for Burrow's wish for an observatory[3];

We cannot pass over the remark at the conclusion of his list of latitudes and Longitudes; wherein he regrets that corresponding observations of Eclipses of the Satellites are not sent out by the Company, because it shows he does not understand our intentions; we mean that the operations in India, whether astronomical or Geographical, should be confined to *actual* observations *only*, leaving the comparisons and results to be made in England, where it can be done more effectually, at much less expence. ...

Mr. Reuben Burrrow's representing that there is no instrument sufficient to determine the place of a star, whereby many occultations of undetermined stars, are useless, is a strong argument why he should have sent those observations home[4] [252].

Though Burrow's observations were of a far higher standard than any hitherto taken in India, and for the next thirty years were accepted as the best available [55], yet mistake were found, and they were gradually superseded. Writing in 1825 of the observations for the longitude of Calcutta made by Pearse and Burrow, Blacker[5] remarks,

The scientific qualifications of both these gentlemen were highly respectable, but their means were limited, and the calculations of the Ephemerides in their time were greatly inferior in point of accuracy to what they were in the present day. It is true that Colonel Pearse refers to some corresponding observations in Europe, but most of the observatories have corrected their longitude since that time[6].

Hodgson[7] writes in 1814,

It does not appear that Burrow took these Longitudes wholly by the satellites; when he did, probably having found the error of their then tables, he applied them to his observations[8]; I should rather suppose from their strict agreement, that he took some places as standards, by occultation of stars or other approved methods, and then took the rest from them, by means of chronometers, for his longitudes are of a precision amongst themselves more than Jupiter's satellites can give[9] [5, 180].

And again,

It was known to the late Surveyor General, Colonel Colebrooke, several years ago, as well as to myself, that the longitude assigned to Hardwar and several places in Rohilcund by Mr. Reuben Burrow, were too far to the west by about 7 miles. The name of Burrow deservedly stands high as a learned mathematician, as well as an expert astronomer, ... but at that time tables were less perfect than at present, and Mr. Burrow used a telescope of small power, and, I believe, took a very small number of observations of the satellites in comparison with ours. I do not presume to disparage the operations of so distinguished an astronomer, so far as his means of accuracy admitted, but it is well known that the due observations of the eclipses of the satellites, and thence determining the differences of longitude, is by no means difficult to any person moderately skilled in practical astronomy, so that those who have the best modern instruments and tables, and can take the greatest number of good sights, can give the most accurate results[10].

Again, pointing out an error in the difference of longitude between Allahābād and Cawnpore,

It was the opinion of the late Colonel Colebrooke, Surveyor General, that an error had been committed by Burrow in the difference of longitude, and that he had made it too much by 5 or 6 miles, owing to his chronometer having run down between the two places[11].

[1] Journal, IO. Maps. MS. 5. [2] Note by Burrow, DDn. 40, XII. [3] Contrast Topping's experience in Madras [171]. [4] CD to B. 15–12–90 (66, 67). [5] Surveyor General, 1823–6. [6] DDn. 204 (151), 12–4–25. [7] Surveyor General, 1822–3 & 1826–9. [8] Satellites obsd. at 43 places on Ganges, Brahmaputra & in Rohilkhand, *As R.* II (484–5); longitudes being given for 91 places in *As. R.* IV (325–8). [9] GBO. Lib. A bM. 88 (450). [10] *As R.* XIV, 1822 (208). [11] DDn. 220 (266), 7–7–1827.

An earlier note by Colebrooke himself states,

The accurate Astronomical observations of the late Mr. Reuben Burrow have furnished us many points on which the Indian Geographer may now with confidence rely, and which he may assume as the most correct data on which he is to ground and regulate his work. It is however much to be lamented that this eminent mathematician and astronnmer did not extend his observations to a wider range, and that during his residence in India his excursions for the purpose of determining the Latitudes and Longitudes of places should barely have reached the 30th degree of North Latitude, ... and there is reason to apprehend likewise that a vast number of observations which he took within that space remained uncalculated at his death[1]. [167].

BURROW'S MEASURES OF THE DEGREE, 1790–1

In 1787, before starting the triangulation that was to connect the royal observatories of Paris and Greenwich, General Roy wrote a short paper describing the principles on which he proposed to work, and pointing out how desirable it was that further measurements should be made to determine the length of the degree in lower latitudes, and suggesting that the Peninsula of India afforded a suitable field for such measurements.

The British Dominions in the East Indies offer a scene particularly favourable for the measurement of five degrees of latitude on the Coast of Choromandel, as has been noticed by Mr. Dalrymple F.R.S. in his paper on the Marine Survey of that coast. Two degrees of *Longitude* at each extremity should likewise be measured.

The plains of Bengal, directly under the northern tropic, afford another situation where it would be of great consequence to determine the lengths of a degree or two of latitude, and as many of longitude[2].

Dalrymple's suggestion, dated December 13th 1784 [190], had been to employ Astronomers to determine the lengths of a degree in that latitude, for at least 5 are easily commensurable on the Coast of Choromandel, which perhaps cannot be done in any other part of the world[3].

Roy sent a copy of his paper to the Directors, and the Court being highly sensible of the importance of the objects likely to be attained by the experiments proposed by General Roy to be made in the East Indies, ... RESOLVED that Major James Rennell and Alexander Dalrymple Esq. be desired...to lay before this Court an estimate of the expense necessary for carrying his plans into execution[4].

Rennell and Dalrymple made joint reply,

Whatever Advantages to Science may be derived from the exact determination of the figure of the Earth, we conceive no other benefit can possibly attend the Admeasurement in Bengal: but that proposed on the Coast of Choromandel will contribute towards the construction of an exact Chart of that Coast. ... It would be unpardonable in us...not to suggest their expediency.

It is only natural that Rennell should not conceive the need for any more "exact chart" of Bengal [160]. Their note concludes,

As the expence attending the operations would be very much encreased by sending Astronomers from England: it would be desirable to have it performed by persons already abroad; and in case no Person immediately in the Company's Service should be found sufficiently accustomed to Astronomical Observations for this purpose, Mr. Dalrymple conceives that Mr. Topping at Madrass and Mr. Burrow at Calcutta are well qualified for this undertaking[5]; ...

whereupon the Directors wrote out,

We have in contemplation to send by the Ships of next Season the proper Instruments [166] for measuring *one or more* Degrees on the Coast of Coromandel: Mr. Topping at Madras, and Mr. Burrow in Bengal were mentioned to us, as persons competent to execute this trust[6].

It was probably the receipt of this letter that led to Burrow's recall from Upper India in February 1789 [161, 162], but it was not until March 1790 that he wrote,

I have received Lord Cornwallis's order to measure the degree of Longitude, and shall immediately proceed to execute it[7].

[1] *Map of Doāb*, MRIO. 16 (10). [2] Roy (37). [3] *Memoir concerning a Survey of the Coast of Choromandel* (5). [4] CM. 6–6–87. [5] Misc. LR. 80 (318); from Dalrymple & Rennell, 15–6–87. [6] CD to B. 20–8–88 (27). [7] BPC. 24–3–90.

Isaac Dalby has written an account of Burrow's measurements[1];

It appears, that in consequence of the late General Roy's representations in 1787 respecting the utility of the Trigonometrical Survey at that time begun in England, the East India Company very laudably had resolved to commence a similar operation on the coast of Coromandel, or somewhere in Bengal; at the same time they intended that the length of a degree on the meridian should be determined, because a measurement of the kind had never taken place near the Tropic.

And it was generally supposed that the execution of this business would have been committed to Mr. Burrow, not on account of his situation as mathematical master to the Company's Corps of Engineers, but because his qualifications for such an undertaking were undoubtedly superior to those of any other person in that quarter. ...

Mr. Burrow expected those instruments in 1789, and so anxious was he to begin about that time, that he wrote more than once desiring a zenith might be purchased for him at any price: but an instrument of the kind could not be procured: besides there were reasons to suppose that one would be sent out the following year on the Company's account.

The want of a Zenith Sector, however, seems not to have discouraged him, for...in 1790 and 1791 he measured a degree of Longitude and also another Latitude under the tropic, with such instruments and other apparatus as he could procure. ...

From a rough journal...and some private letters, I have made out the following list of instruments...

A theodolite; A Sextant.
An Astronomical Quadrant of 1 ft. radius, by Ramsden[2].
A Brass scale, length unknown, by Ramsden.
A 50 ft. Steel Chain, of Ramsden's new construction.
Several Glass Rods, ground to a particular length; Long Bamboo Rods, and some 10 ft. and 20 ft. Rods; Stands for the Rods.
Timepieces and watches by Arnold.

The measurement of this degree of longitude was begun in April 1790 near Cawksally, not far from Krishnagar[3], in Nadia District. Dalby quotes the following account from a letter of Burrow's to Sir William Jones;

My intention at first was to have actually measured a whole degree with rods...as others measure a base; and afterwards to determine the difference of Longitude by going several times backwards and forwards with Arnold's watches. In this manner, by carrying a line directly East & West, all the error of sperical & spheroidal triangles are avoided. ...

As I could not get the Assistant I wanted[4], I saw the time was too short to measure with the rods, and therefore concluded that the best method...would be to trace out the line, and secure with bamboo pins, and measure it as exactly as possible with Ramsden's new invented chain; then make the observations, and afterwards in the cold weather, either to measure the whole with rods, or else such part as would show what allowance would be necessary...for the little irregularities of ploughed land, curvatures, etc.

I have already measured about 36 miles in this manner; the first 15 miles I measured twice over, but found in effect no difference. I have nearly done the Astronomical observations of this part, and shall perhaps get another quarter done before the rains come.

In a letter to the Surveyor General, he writes that he has divided the degree into four parts, and intends to measure the whole over again with rods in the cold weather. The line was laid out by theodolite from the pole star, and offsets were taken to avoid obstacles. Measurement was made by chain, and continued till the middle of May, the whole easting then amounting to about 33½ miles, covering the two easterly quarters.

In June Burrow returned to Cawksally, and began measuring to the west, and by the middle of July when the rains set in, he had completed his third quarter, somewhat over 15 miles. Work was resumed in December by remeasuring the third quarter, making it 12 feet shorter than the first measurement. Measurement was then carried westward to a place called Dhorapara, thus completing the fourth quarter on January 22nd, 1791.

[1] Dalby's account was published in 1796, but no pubd. copy has been found. These extracts have been taken from a MS. preserved in the RS. Lib. (X 140). Dalby was asst. to Roy, & on Ordnance Survey of Great Britain; Math. Professor, RMC. 1799–1820. [2] Jesse Ramsden. b. 6-10-35, near Halifax, Yorkshire; d. Brighton, 5–11–1800; portrait hangs in hall of the Royal Society, Burlington Gardens. [3] 79 A/11. [4] Owing to Mysore War.

During October and November 1790 and again in April and May 1791 Burrow had obtained the rates of his 9 watches. With four of them, he went 12 or 13 times backwards and forwards between Cawksally and Dhorapara. He constantly checked the length of the chain against the rods, whose length he transferred from Ramsden's brass scale; measurements were reduced to the length of the chain at temperature 55°. During the spring of 1791, he measured the length of a degree of latitude, nearly on the meridian of Cawksally. Measurement was made by bamboo rods, nearly 200 feet long, supported on stands. He observed a great number of meridian altitudes of stars on both sides of the zenith.

After Burrow's death his papers went to Dalby, who worked out a length of degree of longitude at 23° 28′ N. to be 55989 fathoms, and a degree of latitude at 23° 18′ N. to be 60457 fathoms. He found that there seemed to be an uncertainty of about 10 fathoms in the length of each of the degrees due to doubt as to the length of the chain, but considered that the degree of longitude was probably as accurate as could be got by the method of timekeepers, and the degree of latitude probably not more than 3 or 4 seconds wide of the truth.

The results have never been used for any deduction of the figure of the earth, and Burrow never considered his operations to be completed;

I have measured both the degree of longitude and the degree of latitude, and there only wants some Astronomical observations making to complete the whole; but as the Company are shortly to send out some instruments of a very superior kind, which probably will arrive by the next ships, as I hear they were nearly finished 5 months ago, I think it would be better to postpone that part of the work till their arrival[1];

and the Council reported,

that to render the work complete, certain astronomical observations are still wanting, which cannot be so well effected without the Assistance of the Instruments of superior construction, which Mr. Burrow expected to receive by the ships of the present season[2].

The Directors had written in May 1790,

The Instruments intended for the Observations recommended by Major-General Roy to be made on the Coromandel Coast are in great forwardness, and Mr. Ramsden gives the most positive assurances that they shall be completed in time to go by some of the ships of this Season[3] [172].

Yet, writes Dalby,

the Instruments necessary for the operation, in consequence of some disagreement among the persons principally concerned in providing them, were never sent from England; ...

and Everest tells us that,

A Large Theodolite was constructed by Ramsden to the order of the E.I.C. for the Trigonometrical Survey of India, and, on account of some enhancement of price for improvements introduced without their previous consent by the maker, was thrown on his hands, and purchased by...the Board of Ordnance [in 1791][4].

It is quite possible that Ramsden's zenith sector which Lord Macartney [99 n.9] took to China in 1793, and which eventually reached Lambton, had been originally intended for Burrow or Topping. However it may be, Burrow's measurement was left unfinished, whilst that proposed for the Coromandel coast was never started [164].

BURROW'S LAST SEASON, 1791–2

In September 1791 Burrow addressed Government,

I beg to offer my services to execute the following very material, and in my opinion most necessary, business. I have already by my former observations shown how very erroneous many of the principal places near the Rivers were, and the Company now seem convinced of the absolute necessity of Astronomical observations in forming a proper map of India, by recommending them in one of their last letters.

In measuring the two degrees aforesaid, I found the interior parts of the country even worse laid down and fuller of mistakes than those bordering on the river; and yet the errors

[1] BPC. 21–9–91. [2] B to CD. 25–11–91 (135). [3] CD to M. 19–5–90 (69). [4] now in the Science Museum, S. Kensington. Everest (20); cf. Close (32).

were not so much owing to the badness of the materials as to the distortions and false positions occasioned by putting them together without having the principal places fixed astronomically at first; I do not speak of little trifling errors, but gross enormous ones, from five to six miles in latitude to 13 or 14 [in longitude], and these in places so near Calcutta as the districts of Burdwan and Beerbhoom.

I therefore would propose to traverse the different districts on both sides of the Ganges, and to determine all the principal places, and as many of the intermediate ones...as can be done without losing much time about them, connecting the whole at the same time by the watches, bearings, distances &c. This would render the former maps and measurements useful, and at the same time furnish a vast quantity of new materials; ... and as the Company seem inclined to spare no cost in having their maps elegantly engraved and printed [1]; it is not without concern that one sees so much of it employed in perpetuating errors [2].

This proposal was approved and the Directors informed that

the expence will be trifling, and the object is of Consequence. Circular letters have been addressed to the several Collectors, requesting them to afford every assistance in their power to the accommodation of Mr. Burrow [3].

Our only clues as to his travels during this season are his "Survey of the Road from Calcutta to Benares between" October 19th 1791 and January 1st 1792 [4]; the cutting of his name, with year 1792, on two Asoka pillars in Bihār, one the "Lion column" about 28 miles north of Bankipore [5], the other about 14 miles north-west of Bettiah [6]; and his death "in his budgarow" at Buxar in June. His journals have not been found, although his executors sent them to Government in September 1792 [7].

COLEBROOKE & HIS SURVEYORS, 1794–1800

The importance of astronomical control was recognized by no one more than Robert Colebrooke, and when he became Surveyor General in 1794 he appears to have started regular observations at Calcutta [202]. In January 1795 he addressed Government;

The Honorable the Court of Directors, having some time since ordered the erection...of an observatory at Madras, it became an object, also, to ascertain the exact difference of Longitude between Madras and several of the principal places in India, to obtain which, ... they send out at the request of Mr. Topping...six telescopes...for observing the eclipses of Jupiter's satellites. ...

One of these Telescopes having been committed to my care, I have taken, and communicated to Mr. Topping, a few observations, but have not been so fully confident of their accuracy as I could have wished, for want of some of the Instruments that are usually employed in observatories to ascertain the time [8].

He writes later to Topping,

As there is probability of Ensign Blunt...being at Point Palmyras during the ensuing month of December to observe the Longitude by the Eclipses of Jupiter's satellites, for which he is furnished with one of the Telescopes you were so good as to commit to my charge, you will I hope...be particularly assiduous in observing correspondent sights at your observatory, and I purpose doing the same here [9].

Blunt had lately returned from his journey from Chunār to Rajahmundry [59–63] during which he had fixed 31 latitudes and 5 longitudes under the following instructions from Colebrooke;

As no single observation of the sun or star is much to be relied on, you will, I hope, avail yourself of your halting days to observe, more particularly by repeating observations, the latitudes of a few places in your route, and, so soon as the planet Jupiter may be visible, you will observe with the Company's Telescope the Eclipses of his satellites.

As correspondent observations will be made here and at Madras, the longitudes of some of the points in your survey will thereby be deduced with the greatest accuracy [10].

In his instructions to Mouat for surveys in Rohilkhand [55–6], Colebrooke writes,

[1] Burrow does not appear to know that Rennell had to bear the cost of printing all his maps himself [227–8]. [2] BPC. 21–9–91. [3] B to CD. 25–11–91 (136, 137). [4] DDn. 270 (30). [5] *Ben. P & P.* XLVII, 1934 (49–50). [6] O'Malley (162). [7] BPC. 10–9–92. [8] DDn 16 (6a), 15–1–95. [9] ib. (98), 13–11–95. [10] DDn. 16 (60), 4–12–94.

As a few of the places through which you will pass have been observed in Latitude and Longitude by the late Mr. Reuben Burrow, these observations will afterwards enable you to correct your work, but as no astronomical observations have ever been made beyond the Hills, I would advise you to observe, if you can, the latitudes of a few places in that part of you track, and afterwards, in returning, the latitudes of Mamdy and Khairbad[1], and also any other places you please.

If however you have not acquired the use of the sextant and the knowledge of practical astronomy in any degree, let not that deter you from making the survey; ... if correction is necessary it can be applied hereafter[2].

Similar instructions were given to Hoare for his survey of the Jumna River [57, 188], which would require

a good sextant for observing by the sun and stars the latitudes of the principal places; without which a survey of such an extent would be liable to considerable errors. If you can also observe by Astronomical observations the longitudes of two or three places, your work will be compleat[3].

Hoare took a great deal of pains over his observations at the Tāj Mahal, Agra, observing for latitude, longitude, and variation of the compass. The mean of 11 observations of the Sun's meridian altitude, lower limb, taken between February 22nd and March 6th 1796, gave a latitude 27° 12′ 46″, whilst he notes the observations of five other observers,

Captain Reynolds, Surveyor General, Bombay	...	27° 10′	00″
William Hunter, Esq, Surgeon to the Resident	...	10	23
Lt. Bushby of the Bengal Army ...	...	10	23
Père Boudier, the one adopted by Major Rennell	...	15	00
Capt. Udney Yates[4], October 13th, 1796 ...	...	10	14

But as I have every reason to believe Père Boudier's observation was made at the Church, I have rejected it from the others, and the medium of the four is 27° 10′ 14″.

Between March 12th and 18th, the medium of 6 careful observations, Meridian Altitude of the Sun's centre, with artificial horizon, inverting telescope, instrument by Troughton, using observatory stand and tripod, gave 27° 11′ 32″.

The medium of 4 observations for the Longitude of the Taj Mahal came to 78° 08′ 07″[5].

Hunter took many observations during his journeys in Upper India between 1792 and 1796, of which the results were published in *Asiatic Researches*[6] [56–7].

In his journey up the Ganges during 1796-97, Colebrooke himself took series of observations between Calcutta and Colgong for latitude, longitude, and "the variation of the magnetic needle[7]". He continued his regular observations whilst at Calcutta, and in volume II (1826) of the *Memoirs of the Astronomical Society* of London were published,

Observations of an eclipse of the moon, in the year 1798, and of eclipses of Jupiter's satellites between 1797 and 1803, taken at Chouringhy near Calcutta, by the late Colonel R. H. Colebrooke. The place of observation was Mr. Bristow's[8] house at Chouringhy, about 3 seconds of longitude in time east of Fort William.

[1] Muhamdi, 63 A/1; Khairābād, 63 A/10. [2] DDn. 16 (63), Dec. 1794. [3] BPC. 20–4–95. [4] Possibly Udny Yule, Ens. Ben. Inf. 13–3–85; Col. 1829. d. 4–3–1830; Uncle to Sir Henry Yule, KCSI. [5] Fdbk. GBO. Lib. Ab. 87. [6] *As R.* IV (141); V (413), & VI (7). [7] Full observations, BMC. 9–10–97 (23) & BMC. 13–3–98 (54). [8] Colebrooke's father-in-law.

CHAPTER XI

ASTRONOMICAL CONTROL, MADRAS & BOMBAY

Madras Observations before 1786 — Topping & the Observatory, 1786-1800 — Military Surveys, 1788-1800 — Bombay Observations — Breadth of the Peninsula — Fundamental Longitudes, Madras & Calcutta.

OUR earliest authorities for geographical positions along the Madras coast are two Frenchmen, the navigator Après de Mannevillette [151], and the Jesuit missionary Father Bouchet, and their values were thoroughly discussed by D'Anville and his English contemporary Thomas Jefferys[1] [178, 211 n. 7], who both pointed out certain blatant errors in the English nautical tables[2] [238].

For the latitude of Cape Comorin D'Anville discusses independant observations by Bouchet, 7° 58′, and Father Thomas, 8° 5′[3], the true value being 8° 0′.

For Madras, D'Anville found that the English had observed the latitude of the Fort to be 13° 15′, and as Après had often found it 13° 13′, he took it as "13 Degrees and about 14 minutes". For Pondicherry, he preferred the observations of Father Boudier "which make its Latitude 11° 55′ 30″, and its Longitude, deduced from several exact Observations, 77° 25′" from Paris[4].

Very thorough astronomical observations were made at Pondicherry between 1761 and 1771 by Mons. le Gentil [180 n. 3] who had been sent out by the King of France to observe the transits of Venus [153–4]. He surveyed the environs of Pondicherry and observed for latitude and longitude, taking an eclipse of the moon, and several observations of the satellites of Jupiter and the lunar hour-angle. He worked out a table of refraction, and determined the length of the seconds pendulum. He made several voyages to the far east and to the south Indian Ocean taking magnetic observations[5].

In July 1755 Thomas Howe [15] observed the longitude of Fort St. George, "by observations of the 1st satellite of Jupiter", to be 80° 28′ 25″ E., whilst in 1761 Hirst [153], "from many observations of the Transit of Venus" made it 80° 2′ 15″ E.; Hirst also made the latitude 13° 8′ N[6].

William Stevens, when acting Chief Engineer in 1778, observed the latitude of Madras to be 13° 4′ 54″, using an "astronomical brass quadrant, on the top of the house usually inhabited by the Chief Engineer[7]".

In his map of 1788 [99, 243] Schlegel gives the position of Madras as "Latitude 13° 8′ 19″, as taken by Major Pringle; Longitude 80° 29′ from the Hon'ble Mr. Howe", preferring Pringle's latitude to that accepted by Rennell, 13° 5′ N[8].

For the survey of the Northern Circārs started in 1773 the Chief Engineer ordered Stevens that,

> In order to ascertain the accuracy of the Survey, you will be pleased to intersect some of Captain Pittman's Stations, which, on closing the whole, should correspond with yours. I should likewise recommend to you the fixing the Latitude and Longitude of the principal Places by Astronomical observation[9].

As has been already told [91–3], this survey was never completed on the large lines that had been proposed, and there is no record of any observations taken.

[1] Jefferys (3). [2] *The English, or East India, Pilot* [200]. [3] *Antiquité Géographique* (119–20.) [4] Jefferys (7–10). True value 11° 56′ N.; 79° 49′ E. of Greenwich, or 77° 29 E. of Paris. [5] Le Gentil. [6] Noted on Dalrymple's reduced map of *Jāgīr*, [88]. [7] *Phil. Trans.* Abr. Edn. XIV 1779 (512). [8] True value 13° 4′ N.; 80° 15′ E. [9] MMC. 22–3–73.

Pringle, though he made no regular observations, records the following in his "Book of Roads"[1].

Latitude of Trichinopoly, in 1776, 10° 49′[2].

Latitude of Tanjore[3], February 27th 1777; observed the Sun's meridian Zenith distance by Astronomical quadrant, adjusted by spirit level only, 10° 46′. Longitude 79° 16′, by Jupiter's satellites, in company with Major Stevens. From this longitude that of Trichinopoly was deduced by survey.

Latitude of Palamcottah by a number of observations of meridian altitudes of the Sun and different stars is 8° 44′[4].

June 1785. Observed the meridian altitude of Fomalhaut by double reflection in a soup plate almost filled with quicksilver, with a good Hadley's sextant.

He also records a number of bearings taken by theodolite from the highest hills, most of them corrected by observed azimuths, taken by himself or Stevens.

In 1785, he proposed that he should make a military survey of the Carnatic [97],

to which may be added as an embellishment, and for the benefit of Geography in general, the exact longitude and latitude of the most remarkable cities and places, mouths of rivers, and for the ascertaining of which, as well as those for surveying, I am already in possession of of every instrument.[5]

Kelly does not tell of any astronomical observations along his earlier routes, but in 1778 proposed to use them for the control of his Atlas [240]; constant observations were taken during his survey of Fullarton's marches in 1783, some of them by Byres [98, 178–9].

It is evident that the general geography of the southern peninsula was at this period far less correct than that of Upper India[6], which was tied together not only by Rennell's survey, but also by the widely scattered observations of Boudier and other missionaries. Writing of Mysore Rennell is grateful for even one isolated latitude;

Although most or all of the roads that appear in the map...have been marched over...at different times; yet seldom having a surveyor with them, or by the want of instruments, or leisure, or both, little has been done for geography, ... so that the whole country can be but vaguely described; no one point...having been mathematically determined. ... Was it not for the observation of latitude at Chinna-Balabaram[7], the position of Bangalore and all the places dependent on it would be involved in uncertainty[8] [99].

Again, in discussing the geography of the Nizām's country, chiefly derived from Bussy's marches [115], he writes,

Col. Peach's march from Ellore to Warrangole in 1767, furnished materials for fixing the situation of that place. ... A memorandum accompanying the survey says that its latitude is 17° 57′. Notwithstanding this assertion, the bearings and distance from Ellore place it in 18° 2′. And I much question, whether Col. Peach's engineer [Gardiner] had any good quadrant with him [92][9].

TOPPING & THE OBSERVATORY, 1786 TO 1800

Michael Topping was the only sailor of all the Madras surveyors, and the fixing of accurate control stations by astronomical observations was his first care.

The first that we know of him is that in 1785 he observed longitudes in the Maldive Islands and in Ceylon; probably on his voyage out to India[10]. Then in November 1786 he made an overland journey from Masulipatam along the coast to Calcutta, and at the request of Sir Archibald Campbell, Governor of Madras, observed latitudes and longitudes at about 40 of the principal places on his way [101–2]. His report shows him to have been a careful and experienced observer;

[1] MRIO. M 52 A. [2] Correct. [3] True value 10° 47′ N.; 79° 8′ E.; 58 N/1. [4] Correct, 58 H/14. [5] MMC. 24–4–85. [6] Not one of the Madras surveyors was a sailor till Topping came. [7] Chik Ballapur, 57 G/11, by a Jesuit missionary [86]. Herbert (61). [8] *Memoir*, 1793 (272). [9] *Memoir*, 1783 (67). [10] *Memoir*, 1793 (45).

I have the honor to transmit for your inspection a course of observations, made...during my late journey. ... I would gladly have sent them sooner, but was desirous of obtaining others at this place to compare them with, and in part to regulate them by.

The latitudes are, I believe, as correct as observations made out of an observatory can ever be expected; I do not think it too much to say in their favour, that they can scarcely ever err in more than half a mile, and in general they must be much nearer the truth. ...

I spared no pains to attain the utmost possible precision in fixing the Longitudes of my four principal stations, ... tho' the satellites of Jupiter were my only dependence in this effort; I generally staid at each station till I got several sights, and trusted to those of the first satellite only; the tables of the motions of those satellites, it is true, are of late years greatly improved, they are still far from being as perfect as we could wish them, for these purposes.

Had the Eclipses I made use of, been observed with accuracy at Madras, it would have been a very great advantage. ...

The Latitudes were all taken with an excellent instrument, on the Hadlean principle, made and graduated by Stancliffe, and an artificial Horizon, on the new construction by Dolland, as were the Altitudes for the correction of the chronometer.

A telescope of Mr. Dolland's, magnifying power about 47 times, was made use of for the Eclipses of the satellites of Jupiter. Several Eclipses were observed that are not registered in this account, which contains only such as were found most correspondent and proper for determining the rate of the Chronometer. ...

The four primary stations were Masulipatam, Vizigapatam, Gunjam[1], and Calcutta.

After describing in detail the record of his observations, he goes on,

I have chosen this mode of registering these results, and the data on which they depend, from a desire...of putting it in the power of any person conversant in these matters, at any future time to re-examine them, and to point out mistakes, if any, in the calculations[2].

The Board were so satisfied with this survey that they ordered Topping to continue his observations to the south of Madras [102],

and also to ascertain the Longitudes of the most remarkable stations in the Carnatic, an undertaking for which he is peculiarly well qualified, not only from his experience in astronomical observations, but also from the excellence of his instruments, which he brought from England with him[3].

and further,

You will of course take the necessary means for having correspondent observations taken at this place, of occultations and eclipses as you may have an opportunity of observing, for the longitudes of your several stations which will tend greatly to confirm the accuracy of the work[4].

It will be remembered that about this time in Bengal, Burrow was regretting that he had no opportunity of getting correspondent, simultaneous, observations taken for him at Calcutta, and was snubbed by the Directors [163], but here in Madras Topping was more fortunate, for one of the members of the Madras Council, William Petrie,[5] was a keen amateur astronomer and gave Topping his strong support and assistance, and was no doubt responsible for drafting the instructions.

Topping writes that he was fortunate in the

choice of a person to make the correspondent astronomical observations at Madras during my operations abroad, a point of the greatest consequence to the accuracy of the deductions, ...

having recommended John Goldingham, who had been assisting at Petrie's private observatory,

and Mr. Petrie has permitted me to make an offer of that advantageous situation for our future operations at the Presidency[6].

Government approval was obtained in January 1788, and when Goldingham took leave to England the following year, Lennon was appointed to carry on the observations. When Petrie went on leave early in 1789, he offered his observatory as a gift to Government, and Topping eagerly pressed the opportunity;

The Astronomical observatory built by William Petrie Esq. for his own private use, but which by his permission...has, since the commencement of my operations, been occupied in the public service, becomes liable...to be transferred into other hands, and...is in danger

[1] Ganjam. 74 E/3. [2] MPC. 11-9-87 & *Oriental Repertory* I (419-50). [3] MPC. 11-9-87. [4] MPC. 30-11-87. [5] Mad. Civ; Writer, 1765; Acting Governor of Madras 1807; Governor of PWI. till death 27-10-1816. [6] MPC. 18-1-88.

of being no longer accessible. ... Should these consequences ensue, the Geographical work I am conducting will hazard a total deprivation of the correspondent observations...essential to their confirmation and perfection. ...

Mr. Petrie...very liberally assured me that the building...was at my entire disposal for the public service, and that I was at liberty to remove it. ... The principal materials of which it is constructed are of a nature to be removed without the least injury to them; ... the whole may be rebuilt at an inconsiderable expence.

The Hon'ble Company possess at this Presidency, several very valuable Astronomical Instruments. They have a very capital Astronomical Clock, an Astronomical Quadrant, and a large and excellent Telescope, besides other Instruments of inferior consequence. ...

Astronomical Instruments of the very first quality are actually constructing in England, by the best artists, and at a very great expence by order of the Hon'ble Court of Directors; ... their destination is for this Presidency and Bengal [164, 166]. I hope I need not add how necessary a convenient place for their safe and profitable reception will be.

Astronomy has ever been acknowledged as the Parent and Nurse of Navigation; and it is doubtless from considerations of this nature, that the Hon'ble Court have come to the resolution of thus affording their support to a science, to which they are indebted for the sovereignty of a rich and extensive empire[1].

The Board asked Topping to suggest a position for the new observatory, and forwarded his proposals to the Directors, whilst Lennon carried on at Petrie's observatory under the following instructions;

You will be pleased to observe with particular attention all visible Eclipses of the satellites of Jupiter; all occultations of fixed stars by the Moon, with such other phenomena as may serve to render these observations of the greatest possible accuracy and utility. ...

The Clock in the Observatory should be particularly examined for each observation... by a sett of at least six correspondent altitudes of the Sun or some fixed star. ...

In making observations on the satellites of Jupiter, I recommend the use of the Company's large Telescope. ... All circumstances relative to the state of the Atmosphere; the position of the Planet, whether it be moonlight, or twilight, or the night dark when the observation is made. ... Everything of this nature should indeed be made so unequivocally plain and obvious, that any person, versed in these studies, who may find occasion on a future day, to examine, or profit by our Astronomical labours, may meet with no doubt or difficulty whatever in understanding and digesting every article recorded in our books[2].

After completing 300 miles of survey along the southern coast during 1788[3] [102], Topping was employed the following year on a survey of Coringa Bay [103]; I have taken great pains to ascertain with exactness the latitude of the Company's House at Coringa, by 55 Meridional Observations of fixed stars. ... The sights on both sides of the Meridian, gave the same result within 7 seconds, whereas they differed as much on the other side, ... a proof how very accurately such observations can be taken with the Hadley, when made by a superior artist, and well divided.

For the Longitude of Coringa, I not only observed as many of the Eclipses of the Satellites of Jupiter as could be seen, but took 48 lunar distances from fixed stars, equal numbers the same evening, on each side of the Moon. In doing this I used a stand for the Hadley, which, though simple, allows the instrument to be readily placed in any possible plane, and for the sake of exactness availed myself of the Telescope [200].

Lastly, the positions of my signals respecting the Meridian were determined, not as is usual by the imperfect method of the needle of the Theodolite, but by Astronomical Observations[4].

In 1790 the Directors agreed that "the Establishment of an Observatory at Madras would be of very great advantage to Science[5]", and Topping, after looking for a suitable site, suggested that,

As therefore I have long had the Institution greatly at heart, it has occurred to me that, if a convenient House already built, and well situated, could be purchased cheap, the necessary additions might be made at small expence. ... One...motive for my recommending an immediate purchase of this kind, in preference to my being employed in erecting an entirely new building, is the desire I feel to prevent any unfavourable suspicions from lighting upon me, or any idea arising that I have *private emolument* in view. ...

[1] MPC. 27-1-89. [2] MPC. 16-6-89. [3] From this triangulation Topping deduced the length of a degree along the meridian, quoted by Allan in 1789. (MRIO. M. 77). [4] *Mad. Sel.* XIX. 1855 (26). [5] CD to M. 19-5-90 (52).

Our operations have already suffered great injury from the Observer residing at a distance from the place of observation; and at present little can be done of any consequence, the Instruments having been necessarily removed from the Observatory during the late hostile aspect of affairs at Madras [1].

The purchase of Mr. Turing's house at Vepery was suggested at 5,000 Pagodas, but the owner promptly raised the price when he saw that it was wanted by Government, and Topping writes;

Since the disappointment we experienced relative to Mr. Turing's House, I have enquired particulars of every Garden-House near Madras that has been offered for sale. ... Of these ...I have proposed terms for two only, Mr. Edward Garrow's House on the Plain, and Mr. Davidson's at the Luz. Mr. Garrow's is no longer for sale, and the proprietors of Mr. Davidson's House require more than I can venture to recommend [2].

He therefore submitted plans and estimate for a complete new building, "which may be executed with the very best materials" for 6,500 Pagodas.

An amusing controversy now sprang up between the Chief Engineer and Topping, Major Maule[3] disputing Topping's good faith and ability, and declaring that both design and estimate were untrustworthy, and suggesting that Topping was trying to usurp duties that rightly belonged to the engineers [4]. Topping fortunately closed the dispute by finding that Garrow's house could now be secured for

the very moderate sum of five thousand Pagodas, ... and would compleatly answer the purposes. ... The apparatus for fixing and securing the astronomical Instruments will cost from fifteen to eighteen hundred Pagodas, and not more. ... Our operations will than be resumed, and every interruption removed, our valuable Instruments will not lye entirely useless and unemployed, as they have unavoidably done for several months past [5].

Government thereupon issued orders for the purchase to be made and advanced the money for making the necessary additions; the purchase was completed by the end of 1791, and in November of the following year Topping was able to report;

The new observatory is...in readiness to receive the astronomical instruments, which will be placed therein in a few days; and I had it in contemplation...to traverse the Bay, whilst the north-east winds prevail, with the time-keepers lately sent me by the Hon'ble Court of Directors [203]. ... The celestial phenomena at that time will be particularly favourable to such an undertaking; not to omit the fineness of the season during the first three months of the year for sea operations. I am therefore of opinion that so rare an opportunity should not, if possible, be neglected [6].

We have no record of this trip being carried out, and a few months later Topping left for the Kistna and Godāvari [106], leaving Goldingham in charge of the observatory, which he connected to sea-level in March 1794[7].

Whilst making arrangements for the building of the observatory, Topping had not overlooked the provision of adequate instruments, though much valuable work had already been accomplished with the few instruments left by Petrie. Topping writes,

Every correct observation made at Madras that has a corresponding one with which to compare it, taken under any other meridian, determines at once the relative longitude of the two Places: this proves the necessity of compleating our Astronomical Establishment as soon as possible, and shows the very extensive advantage to be derived from this kind of observations, which are capable of settling with all desirable accuracy, the positions of places, however situated or remote on the Globe. Since I first recommended these observations to be constantly made, I have obtained a great many taken in distant parts, whereby the relative Longitudes of *Madras, Calcutta, Bombay, Canton* and Port Cornwallis have been already determined. ... [181]

The Honorable Company having...thought proper to establish an Observatory at this Place, and to honor me with the conduct of it, ... I first recommend the correspondent astronomical observations, as the only sure and practicable method of finding the relative position of *distant* transmarine situations; and I indulge myself in a hope that, by the help of these observations, and the use of Chronometers, I shall in a very few years see the Charts of these Eastern Seas in a more correct state than those even of Europe are; or at least a regular system established for the perfection of Indian Geography [8].

[1] MPC. 17-6-91; the Third Mysore War was in progress. [2] MPC. 26-7-91. [3] Acting for Ross who was on service in Mysore. [4] Love, III (415); Mack. MSS. LXIX, 27-7-91, *et seq.* [5] MPC. 30-9-91. [6] MPC. 13-11-92. [7] cf. Mack. MSS. LVIII (2). Goldingham's MS. observations of 1793, with account of building of the observatory, preserved at Kodaikanal Observatory, 1940. [8] MPC. 27-12-91.

In 1792 Topping snbmitted two professional papers, one *On the most advantageous method of taking correspondent observations of the satellites of Jupiter*, and the other *On some new Improvements in the Hadley sextant.* ... My general plan of operations for improving the geographical knowledge of India, is also exhibited in these papers, ... I have spared no pains to render our astronomical institution as beneficial as possible to the important sciences of geography and navigation[1].

Regarding the second paper the Directors replied, in a somewhat obstructive mood,

We are informed the simplicity of the Hadley in it's use for surveying is such that any person of the commonest capacity may in half an hour be completely instructed in the use of it, and what is most desired by us is a speedy knowledge of the geography of India, in attaining which scarce any mathematical knowledge or anything except common instruments are necessary, and we are persuaded the less difficulty that is made to attend science, the more speedy and effectual will be its progress, nor do we think Mr. Topping's active duties will allow time for executing his proposed Treatise[2].

Sanction was obtained for the appointment of a Brahman assistant, to be trained to make astronomical observations, and relieve the Astronomer in case his services were required on some distant survey, for the Directors still considered that,

Although correspondent observations at the observatory are very desirable, yet that consideration cannot be admitted as a compleat excuse for postponing the *actual surveys.* ... Mr. Goldingham is not to be prevented carrying on the survey by attendance at the observatory, the observations at which, as before observed, must be considered as a secondary consideration[3].

Goldingham was however relieved from distant surveys, and given charge of the surveying school [284]. Another of his duties was the preparation of an almanac, suggested by Topping;

Mr. John Goldingham, Assistant Astronomer at the Company's observatory, having at my desire, computed an almanac for the Meridian of Madras, a work free from the errors that have usually disgraced publications of this kind in India, and in which are included several matters beneficial to the Navigation of these Eastern Seas, I request to know whether the Hon'ble Board will give permission for its being published by authority of Government[4].

The observations made at the observatory, including a meteorological journal, were now regularly sent home, and the Court resolved "to publish them for the benefit of the world[5]." On Topping's death in 1796, Goldingham succeeded as "the Company's Astronomer and Marine Surveyor on the Coast".

Madras Observatory was a worthy monument to Michael Topping, and continued to be the home of important scientific work directed by a succession of distinguished astronomers, until in the year 1899 its operations were transferred to Kodaikānal[6], a change which amongst other advantages affords a clearer atmosphere.

The observatory grounds are in College Road, Nangambaukam, but the buildings are no longer those which Topping knew; the observatory was rebuilt in 1850 and is now, 1938, occupied by the meteorological observatory; the Astronomer's residence was rebuilt in 1869.

MILITARY SURVEYS, 1788–1800

The only record found of astronomical observations taken by Beatson or Allan is the entry "latitude of Church Steeple in Tranquebar, 11° 1′ 20″[7]", in a field-book of Allan's.

Mackenzie definitely states that on his Guntūr survey of 1788 "no observations of the variation were taken for want of time and proper instruments[8]". He intended to take observations for latitude after joining the Nizām's detachment in

[1] MPC. 24–1–92. [2] CD to M. 23–4–94 (67). [3] CD to M. 23–4–94 (63, 66). [4] MPC. 9–12–94.
[5] CD to M. 3–2–96 (39). [6] 58 F/8. [7] Fdbk. MRIO. M. 77. [8] *Oriental Repertory* I (57).

1792, for he then took a sextant with him, and the Chief Engineer was trying to get him an artificial horizon in Madras [205]. In 1795 he writes of his map of the Deccan,

Several observations in the fieldbooks for Latitude and variations [remain] to be examined and calculated, and others to be taken to correct the Geographical situation of places[1].

The difference of his outlook from that of Topping is at once evident. Mackenzie took latitudes to *correct* his perambulator and compass traverses, whereas Topping made his astronomical observations first, regarding the *situation of* places as of the first importance, and the filling in of detail as a secondary matter.

The Bengal surveyors, Kyd and Colebrooke, who came down for the Mysore War of 1791-2 [112–3], had the utmost respect for astronomical control; particulars of Colebrooke's observations are published in *Asiatic Researches*[2]; and he has left the following notes;

Tables showing results of observations of different stars; also comparison of the survey with the astronomical observations. ... Instruments used were,

A fine Sextant by Troughton of 9 inches radius.

An Artificial Horizon of pure quicksilver over which, when the wind rendered it absolutely necessary, a glass roof was placed [162, 200].

An achromatic telescope by Dolland with three tubes of different magnifying powers, the greatest of which might have been 200 times, but the middlemost was used in the observations until after the end of June, when the instrument being stolen by some thieves from the Mahratta camp, a smaller telescope was procured.

An Arnold's chronometer was used in observing time. ...

Frequently Amplitudes and a few azimuths were taken, to ascertain the variation of the needle, which never exceeded one degree, except when attracted by the Iron Ore in the Rocks, upon which, for the convenience of having a more distant view, it was necessary sometimes to put up the instrument. These local variations were ascertained nearly in the protraction of the map, and the bearings were corrected, or their differences were applied as Angles[3].

Benjamin Sydenham describes the observations he took when marching up to Hyderābād in 1798 [117]. He had trouble with his chronometer [203], and had to take a departure from Masulipatam instead of the Madras Observatory. ... The longitude of Masulipatam Flagstaff had been deduced from Jupiter's satellites during the years 1793-94-95, and the medium rate of 2 chronometers for a still longer period observed at Masulipatam, by Mr. Topping, and at Madras by Mr. Goldingham, and finally deduced by the latter as Madras 81° 6′ 00″·5; Masulipatam 81° 15′ 39″·75[4] [181]. ...

The altitudes were taken with a most excellent sextant of 8 inch radius, lately constructed and sent out by Mr. Stancliffe of London. The Eclipses of satellites were observed by a refracting telescope by Dolland.

Observations were taken continously on the march up, and after arrival at Hyderābād. Repeated observations for longitude were taken from May 28th to June 23rd, "near Captain Mackenzie's Bungalo at the camp of Hussein Saugor" giving longitude 71° 46′ 08″; they were then closed down owing to rainy weather.

In October, when the weather cleared, operations against the French Troops prevented observations being taken before the French surrender on October 22nd [117]. The march of the English Detachment to the Carnatic which took place on December 13th, left a very short interval to be devoted to a subject which requires much time and attention: and prevented our ascertaining the correct Longitude of Hyderabad.

Observations were however made between November 17th and December 12th, and the position of Hyderābād reduced to 17° 21′ 43″·3 N.; 78° 44′ 56″ E.[5].

Sydenham continued his observations on the march southwards, and then, having occasion to return to Madras on business, advantage was taken of this circumstance to send the timekeeper down to the Observatory to ascertain a new rate, and take a departure from Madras. ... Arriving at Amboor on 21st [February 1799], sights taken to deduce Longitude 78° 42′ 43″, Latitude 12° 51′ 33″[6]

[1] His fdbk. of 1797 gives regular obsns.; BM. Addl. MSS. 13582 (19) & MMC. 18–5–95. [2] *A. R.* IV (321–4) [3] Note on chart, MRIO. 138 (41). [4] True value 81° 8′ E. [5] True position, 17° 22′ N.; 78° 27′ E. [6] True position, 12° 48′ N.; 78° 43′ E.; Journal, MRIO. M. 83.

BOMBAY OBSERVATIONS

D'Anville found great uncertainty about the geography of the west coast, and little he could trust beyond a few observations by Portuguese sailors and Jesuit missionaries ;

Latitude of Cochin observed by father Thomas is 9° 58′.

The longitude of Goa by the unanimous application of geographers is 71° 25′ East from the Royal Observatory at Paris, which makes it 91° 25′ from the Island of Ferro[1] [242 n. 2]. ...

The latitude of Surat is 21° 10′ [149 n. 10]; and its longitude, in the Connaissance des Temps is 70° from Paris; ... But Surat is not placed so far to the Eastward in the [*Carte de l'Inde*], by at least half a degree; and M. Delisle makes it the same in his map entitled *Côtes de Malabar et de Coromandel*[2].

The traveller Mandelslo[3], a map of whose travels is mentioned by Rennell [127 n.7], accompanied a Dutch embassy to Persia, and went on to India, reaching Surat in 1638; he visited many places in Gujarāt, and then went up country to Agra and Lahore. Returning to Surat he sailed to Vengurla[4] in January 1639 and visited Bijāpur[5], at that time the capital of the Deccan. It is said that he was instructed in the use of the Astrolabe, which he used in making observations of the Latitudes and Longitudes of the places found in his Journal[6].

Duperron tells us that the accepted longitude of Goa, 73° 45′ E. of Greenwich, was calculated by Cassini from an observation of the eclipse of the moon made on December 21st 1684 by the Jesuit Father Noël, and Bernoulli notes,

Il m'est tombé sous la main un petit ouvrage...intitulé *Observationes mathematicæ & physicæ in India & China*, factæ a Patre Francesco Noël...ab anno 1684 usque annum 1708. Prague, 1710[7].

Thirty years later Rennell found a good deal more data at his disposal. He was confident of the latitude of Bombay, 18° 58′ N.,

and accepted its longitude by Mr. Howe's observations 72° 38′. ... The positions of Cape Ramas, Angedive and Carwar points[8] are corrected...by a set of observations and bearings of the late Capt. Howe, whose attention to marine science was equal to his gallantry and knowledge of the practical part of his profession. I have had occasion repeatedly to acknowledge the aids I have been furnished with, by means of his collection of Observations and Remarks, in the possession of Mr. Dalrymple[9].

Some time between 1778 and 1787 Captain Huddart, commanding the *Royal Admiral*, carried a set of chronometers down the coast from Bombay to Anjengo, and then back to Bombay; by which the error of his timekeeper was ascertained, and was only as much as amounted to $2\frac{1}{4}$ minutes of longitude; we have every reason to be satisfied with this series, ... and indeed geography is greatly indebted to this gentleman, who has presented us with the longitudes of 16 places on this coast, and by that means given the true general figure of it[10] [179].

Though fully recognizing the importance of Huddart's series, Rennell at first rejected his value for Bombay, and adjusted his work to Howe's longitude; but he eventually found that Huddart's value, 72° 54′[11], sixteen minutes greater than Howe's, fitted his other data much better[12] [179].

He took his longitude of Surat by applying Stewart's survey of Goddard's route to Smith's observation at Burhānpur [31, 121–2], but Reynolds moved it "18 miles more to the Westward" to agree with the position of Broach, remarking,

This change of situation lengthens the distance between Surat and Boorhanpore. I have divided it between the different stages, not choosing to alter the position of Boorhanpore as it is fixed by Mr. Smith[13].

The position of Broach had been observed by Charles Turner during his survey between 1775 and 1780[14] [122].

Reynolds apparently made no observations during his survey of Bednur in 1783, for Rennell was only

[1] or 73° 45′ E. of Greenwich; true value 73° 57′. [2] True value 21° 12′ N.; 70° 30′ E. of Paris. Herbert (35, 48, 59n). [3] from Mecklenburg; *Calcutta Review*, I (297). [4] 48 E/9. [5] 47 P/9. [6] *Histoire Générale des Voyages*; 1755, by Abbé Prevost. Broadway Travellers. [7] Bernoulli, II (483–5). [8] 48 E/16 & J/2. [9] *Memoir*, 1793 (29). [10] ib. (18). [11] Correct value, Colaba Observatory, 72° 49′ E. [12] *Peninsula* (2). [13] Bo S & Pol. 8–1–88. [14] Note on *Map of the Baroche Pargannas*... Dalrymple [123 n. 3]; Orme MSS. 336 (23).

furnished with the means of joining this portion of geography to the rest, by having the longitude of Pigeon Island determined by Capt. Huddart[1].

In his later surveys through the Marātha countries Reynolds appears to have taken regular observations, at any rate for latitude, and expresses complete confidence in them [126], though he writes[2];

My surveys are corrected by observations, and I take this opportunity to mention the difficulty I labour under for want of good Instruments. The Hon'ble the Court of Director's have sent out Instruments for the purpose of the marine survey, ... and I trust they will consider me entitled to the same assistance... ; besides the Instruments which have come out for the marine survey a Perambulator as well as astronomical Telescopes are necessary; the latter for convenience sake should be as short and as light as possible; Ephemeris should also be sent out[3].

To start the marine survey [124] the Directors had sent out

one Box, and two Pocket, Chronometers or Timekeepers, and enclose the Astronomer Royal's account of their Rate, together with instructions for the use of them; likewise an Azimuth Compass, a Sextant, and an Artificial Horizon, for finding the time by altitudes...on shore; a Telescope is also sent[4].

The first really trustworthy observations at Bombay were made in June 1790 by Goldingham, on his return from leave, and were submitted to Government by Topping with the following letter;

I take an early opportunity of laying before you a series of observations made at Bombay by Mr. John Goldingham, which determine the Geographical situation of that place, I have no doubt, very accurately: it consists of a great number of Lunar observations; Meridional altitudes of the Sun and Stars; Eclipses of the Satellites of Jupiter, and Azimuths of the Sun; with a few remarks on the rise and fall of the Tides.

The Longitude of Bombay in the latest and best Charts hitherto published has an error of full 20 minutes; a circumstance of pernicious consequence, as the positions of other places on the Malabar Coast are, no doubt, equally falsified by this mistake: It is by a great number of *accurate* observations only that the true position of the several parts of the Globe can be determined and Geography brought by degrees nearer perfection[5].

Emmitt gives a very complicated account of the construction of the map which he compiled from his surveys with Little's detachment [128–30]. He had made only nine observations for latitude, and two for variation of the needle, and for the former never took more than five double altitudes at any one place. He made no observations for longitude, but hung his survey on a value for Seringapatam supplied by Kyd, and on the accepted longitude of Goa. After laying down a rough plot of his traverses, he worked out a scale of latitude and longitude to fit these observations and values and form the projection for his fair map; the following extracts from his description show the devices that surveyors had to use for lack of an orderly system.

For my correction of Longitude I used the following method (not having been able to provide myself with a proper Telescope and time-piece...). At Col. Fredrick's encampment, ...the 2nd December 1790, I observed the double altitude of the Sun's Lower Limb. The 5th I observed [again]. ... I took the mean Latitude of these two...for the true Latitude of our encampment; from thence I proceeded to Dharwar surveying; ... I observed the Latitude of the flag-staff in Dharwar Fort by a mean of five good observations. ...

The difference of Longitude by a careful measured line from thence to Goa, 1° 09′ 40″, supposing the Longitude of Goa to be 73° 45′ [176] fixes Dharwar in 74° 54′ 40″, which agreeing with Capt. Kyd's survey from Madras to Sreerangputtum[6], and nearly with my own from Jayaghur[7], I have therefore placed it in the above situation, viz., 15° 27′ 50″ North, and 74° 54′ 40″ East. Considering this as a point well fixed, I have corrected all my surveys from it in the following manner.

On begining to make a fair copy of my surveys, I noted down the difference of latitude between Jayghur, Darwaur, and Sreerungputtum (the latter by Capt. Kyd's observations...). By the number of Geographical miles of Latitude contained in this difference, I divided my rough copy, and by the distance...formed by these miles, I set off the miles of Longitude, decreasing them in their proper proportion, thereby connecting the Longitude of every part of my surveys to as great a certainty as the Latitude. ...

[1] *Memoir*, 1793 (28). [2] Bo S & Pol. 29–4–85. [3] ib. 8–1–88. [4] CD to Bo. 8–3–86. [5] MPC. 21–10–91. [6] Seringapatam. 57 D/11 [249]. [7] Jaigarh R. 47 G/3.

All the places where I ascertained the Latitude from observations, I have mentioned at the bottom of this letter, and also the variation of the compass, ...[185]. The sextant I made use of is a patent one made by Gregory and Wright.

I have been more particular in describing the method, ... that those who may be acquainted with a better method of correcting them for Longitude, may have it in their power, and to judge how far any error may have been introduced into my works[1].

On his map of northern Malabar, submitted in 1794, Emmitt has the following note,

As the value of a survey increases in proportion to the accuracy of placing its latitude and longitude lines, I deem it proper...to explain the method I took...in the map.

First respecting the latitude, I insert as a specimen the observations which I made for the latitude of the mouth of Balliaputtam River[2], and as I made use of the same means... for attaining the latitude of all the particular places in the Coorg, Soulea, and Anirah countries, as also the coast of Malabar, and, having fixed such points correctly in the survey renders it unnecessary for me to insert a list of their geographical situations, such being atttainable from a reference to the Map.

His specimen shows meridional altitudes observed to *Capella* and *Canopus*;

The Longitude lines I have laid down from Capt. Huddart's observations, who makes Mount Della[3] 75° 16′ E. of Greenwich.

The variation of the needle at the head of the Heggut Ghaut, I found by equal altitudes of the sun, the 2nd January 1793, 54′ East. ... At Cannanore, 8th Sept. 1794, 38′ E.[4].

BREADTH OF THE PENINSULA

One of the first things that strike the eye when looking at the early maps of India is the extraordinary shape given to the peninsula as compared with that of modern maps, a result of the great uncertainty of the earlier observations for longitude.

Though the general line of the east coast was fixed by repeated observations at Calcutta, Madras, and Pondicherry, and by Ritchie in 1770–1 [16–7], it was not laid down with reasonable accuracy until the return march of Pearse's detachment in 1784, though this line only touched the coast occasionally. The actual line of coast from Bengal to the Palk Straits was surveyed by Topping and Goldingham between 1786 and 1794 [102–5].

The true line of the west coast remained largely a matter of conjecture till the surveys of Huddart and McCluer between 1780 and 1789, and even then there was much doubt as to the longitudes.

The breadth of the Peninsula was discussed by D'Anville in 1752, when he adopted a value for the longitude of Pondicherry

more conformable to the Breadth of the hither peninsula, deduced from itinerary measures. He makes the Breadth between Pondicherri and Maha[5], on the Malabar coast and almost in the same parallel, 86 leagues, of 20 to a degree, whereas other Geographers give 100 leagues[6], a difference of longitude, 4° 18′, which is in remarkable agreement with the true value, 4° 16′.

In discussing the 1783 edition of his *Map of Hindoostan*, Rennell compares it against

former maps, the most accurate of which makes the breadth of the hither India (or that included between the mouths of the Ganges and Indus) near 2 degrees and a 1/4 of Longitude narrower that it appears in my map; at the same time that it makes the lower part of the Peninsula 3/4 of a degree *wider* than mine does. I have been enabled by means of observations of Longitude taken at Bombay, Cochin, Madras, Calcutta, Agra, etc., together with measured lines and surveys extended from the above places, to frame a very good groundwork for my map[7].

By the time the map reached India, Kelly had carried a surveyed line from Negapatam on the east coast to Palghāt, only 50 miles from the west coast [98–9], and he made the peninsula 26½ geographical miles, or minutes of arc, wider than Rennell;

[1] Bo S & Pol. 23-11-92. [2] Valarpattanum R. 49 M/5. [3] 48 P/4. [4] Map, MRIO. 135 (46).
[5] Mahé, 49 M/10. [6] Jefferys (8), Herbert (58-a). [7] *Memoir*, 1783, Preface.

The latitude and longitude of Policaud[1] being thus ascertained; being in possession of Col. Humbertston's route from the Malabar Coast to this place; also the routes of several of our officers who marched with detachments from hence to Cocheen; I cannot...place Paniane[2] in a higher latitude than 10° 34′, nor in a greater longitude from London than 75° 59′; whereas Major Rennell places it in 10° 50′ and in longitude 76° 25′ 30″. I find that Cocheen[3] lies in...longitude...76° 3′ 30″ instead of 76° 48′ which he was led to place it in. ...

Upon the whole I find that Major Rennell's maps...loses 26½ Geographical miles in longitude between Panian and Nagapatnam. And the more to confirm the Major in this error, he has the authority of Mr. Smith's observations in 1776, which place Cochin in longitude 76° 26′ 30″.

I have thought it necessary to be thus particular, that the Honorable Board might be satisfied as to the grounds on which I have presumed to differ from so able a geographer as Major Rennell[4] [98].

In his *Memoir* of 1788, Rennell discusses the question again, making use of the surveyed lines of Fullarton's and Humberstone's marches, and the longitude observations of Howe and Huddart, which he finds agree to within a minute in giving the longitude of Tānūr on the Malabar coast a mean value of 75° 50′ 10″, and he concludes,

With respect to my former idea of the breadth of the peninsula, although the extent in longitude between Bombay and Madras, remains nearly as before; yet by the swelling out of the coast on the south of Bombay, I reckoned it too narrow by about 30 G. miles in the parallel of Madras; and 27 in that of Pondicherry;

thus exactly agreeing with Kelly.

The Mysore war of 1790–2 brought new measurements further north, but no direct line; and Rennell writes of the second edition of his map of the South Peninsula [243–4],

As it is not known whether the distant between Seringapatam and Cannanore..., in the sketch drawn by Capt. Reynolds, ... was actually measured; we are still left in a state of suspense concerning the true breadth of the Peninsula in that important parallel. I am, however, strongly inclined to believe that it was measured; because it seems likely that Capt. Reynolds... had an opportunity of doing it; and because his representation of the distance differs in some degree, from all the former accounts of it; to which may be added that his result agrees nearly with the computation of the land marches and with Capt. Huddart's longitudes[5] [130–1].

In 1800 Colebrooke having compiled a new map of the Peninsula [244] re-opened this question, and though the maximum changes that he found were less than 20 miles, it will be seen in the table below, that across the Mysore belt his latest width was from 20 to 60 miles too great. Kelly's surveys had brought the width further south very near the truth, but the impossibility of carrying survey directly across the territories of Mysore and the Deccan had prevented the survey of any direct lines from coast to coast north of the 11th parallel. Colebrooke writes[6];

As it appears from the accompanying map, constructed chiefly from Actual surveys, that the Breadth of the Peninsula is throughout narrower than it had formerly been represented, a comparison of it with the latest construction...by Major Rennell may not be uninteresting. The following table exhibits the comparative breadths under the several Parallels, from 10 to 16 Degrees, and will also serve to verify the longitude of several places upon the Malabar Coast.

PARALLELS	Breadth of old construction [Rennell] 1793	Breadth of the Peninsula [Colebrooke] 1800	Modern Maps (1930)	Excess (2)–(3)	Further Excess (3)–(4)
(1)	(2)	(3)	(4)	(5)	(6)
15° (Karwar) ...	524	512	518	12	– 6
14° (Phatkal) ...	421½	404	376	17½	28
13° (Mangalore) ...	404	386	367	18	19
12° (Cannanore) ...	390	371	312	19	59
11° (Calicut) ...	277	268	274	9	– 6
10° (Cochin) ...	216	201½	204	14½	– 2½

[In this table the number of miles in columns 2, 3, and 5 are those given by Colebrooke; columns 4 and 6 show the errors that yet remained in Colebrocke's map.]

[1] Palghāt, 58/B/9. [2] Ponnāni, 10° 48′ N.; 75° 56′ E. [3] Cochin, 9° 58′ N.; 76° 14′ E. [4] BPC. 28–6–84. [5] Peninsula (1). [6] B Pol C. 10–7–1800.

FUNDAMENTAL LONGITUDES OF CALCUTTA & MADRAS

There was so much difficulty in the determination of longitude, that many of the earlier maps made no attempt to indicate longitude from Europe, but merely showed a meridian line through either Calcutta or Madras, sometimes with other meridians measured from it [225, 229, 239]. We have already noticed the efforts of Pearse and others to determine the longitudes of these primary points with some precision, but it was not until the founding of the Madras Observatory, and the publication of Maskelyne's [155 n.13] new astronomical tables, that the problem could be tackled with any confidence.

Colebrooke took up the subject with enthusiasm, and extracts from his correspondence with Goldingham between 1800 and 1803 will give an idea of how the matter then stood.

It was remarkable that in many of the old Charts, and indeed in some which have lately been published, the longitudes were mostly found to lie too far East. ... The late Mr. Reuben Burrow...has pointed out...an error both in the common practice of making the Lunar observation and method of computation, and Doctor Dinwiddie[1] has more recently made it appear that an error in the Lunar Tables, tending to increase the apparent longitude of places East of Greenwich, ... does so actually exist. ...

The Eclipses of the Satellites of Jupiter have afforded a more easy and correct way of ascertaining the Longitudes of places at land, ever since tables of these Eclipses have been calculated and published in the Astronomical Ephemeries, but yet these Tables have been found to be not altogether free from error. ... Correspondent observations of the same phenomena, should always be preferred when they can be procured.

An Eclipse of the Moon affords an easy method of finding the longitude...; the observation is of course liable to error, yet the mean of several will give a pretty accurate result. ...

I shall now give my reasons for having fixed the longitudes of Madras and Pondicherry in the accompanying map differently from Major Rennell...by 8 minutes of a degree.

Major Rennell...has stated the longitude of Madras, at 80° 24′ 40″, which he derives from the observations of three different gentlemen, Messrs Howe [169], Dalrymple [qv.], and Topping, but does not mention in what manner the observations were made; it is probable however that they were all lunar[2], and if so, that those of the two former were taken at a time when the Hadley's Quadrant, or Sextant was very far from that state of improvement to which those instruments have lately been brought; in that case an error of a minute in taking the Lunar distance might easily have happened. ...

M. le Gentil[3] was deputed by the king of France to observe at Pondicherry the Transits of Venus over the Sun's disc, what took place in the years 1761 and 1769; unfortunately he did not arrive there in time to observe the first, and was prevented by cloudy weather from observing the second; during the time of his sojourn at that place, he...determined its longitude by a series of observations of the Eclipses of Jupiter's first Satellite, which he deduced from correspondent observations...taken at Greenwich and in France. ... The result was Longitude of Pondicherry East of Greenwich, $5^h\ 19^m\ 26^s$ [169].

If the Longitude of Madras be deduced from the above by adding the difference of Meridians by survey, viz, 25 minutes of a degree, we shall have...80° 16′ 30″. ... I have likewise inferred the Longitude of Madras from Calcutta.

Taking Pearse's longitude of Fort William as 88° 22′ 07″·5, and applying bearing and distance from his own surveyed line along the east coast [41–2], Colebrooke derives a value for Madras very close to that from Le Gentil's observations. He then considers Burrow's longitude of Russapugly [160, 162];

As Mr. Burrow resided a considerable time at Russapugly, it is also possible that his observations at that place would have been more numerous and various than anywhere else, of which although he has not left us the detail, yet we may venture to take the result on the word of a man of such distinguished abilities.

Now by taking the longitude of Fort William, as deduced from Mr. Burrow's longitude of Russapugly, and applying the difference of Meridian, ... the longitude of Madras will be $5^h\ 21^m\ 06^s$, agreeing exactly with that which was deduced from le Gentil's observations, and differing only half a second from the longitude inferred from Colonel Pearse, which very close

[1] James Dinwiddie, LLD. spent several years in Calcutta from 1795. [2] Nearly all to satellites of Jupiter. [3] Guillaume Le Gentil de la Galaisière; of the Académie Royal des Sciences; pub. account of magnetic & other scientific work at Pondicherry & over the Indian Ocean [156].

coincidence, though possibly in some degree fortuitous, at least proves that there cannot be any material error in any of these results. I have accordingly placed Madras in 80° 16′ 30″[1].

Goldingham replied in 1803[2];

About 53 sets of Lunar observations was taken at Madras with different Instruments; and the results, reduced to the Hon'ble Company's Observatory, gave its Longitude 80° 19′ 55″ East of Greenwich.

Also 38 sets of Lunar observations were taken at Coringa; ... by observations with Chronometers three successive years[3], Masulipatam was found East of the Madras Observatory 54′ 56″; Coringa had been previously found East of Masulipatam 1° 10½′, and therefore East of the Observatory 2° 5′ 26″; hence the Longitude of the Observatory by these observations will be 80° 20′ 38″.

Also, 48 sets of Lunar observations were taken at Bombay, which gave the Longitude... 72° 57′ 23″. By a capital choronometer, the difference of Longitude from Bombay to the Madras Observatory was 7° 24′ 35″[4]. The Longitude of the observatory of these observations is therefore 80° 21′ 58″. I have reason to think, from other observations in my possession, this difference of Longitude is very near the truth.

The Eclipses of the satellites are very numerous. The first result was obtained in the year 1787, by correspondent Eclipses taken at Greenwich, Canton, Calcutta, and Madras; which gave the Longitude of Canton 113° 19′ 07″, and the difference of Meridians between Canton and Fort William 24° 54′; hence the Longitude of the latter, by these sights, is 88° 25′ 07″.

By a lunar eclipse observed with great care, the Longitude of Fort William was 88° 25′. And by correspondent Eclipses at Greenwich it was 88° 24′ 53″. ...

All the Madras observations were taken at Mr. Petrie's observatory. The Longitude of Canton was determined...by Captain Huddart; and the Calcutta observations were taken by Mr. Lindley, formerly Assistant to the Royal Observatory. ... By correspondent sights at Madras and Canton, the Longitude of the former was 80° 19′ 53″.

By a series of Eclipses of the satellite of Jupiter, observed between the years 1787 and 1790, and the Tables corrected by observations at Greenwich taken at or about the same time, the Longitude of the Company's Observatory is 80° 17′ 14″.

Taking a mean through all these values Goldingham deduced the longitude of the Observatory to be 80° 19′ 21″·2. He then discusses the calculations made by Colebrooke, and after making various small changes, and combining his results with those already detailed, he deduces the following,

		[Modern Values]
Fort St. George Church	... 80° 21′ 15″	[80° 17′ 16″·48]
Madras Observatory	... 80° 18′ 54″	[80° 14′ 15″·76]
Fort William ...	... 88° 25′ 12″	[88° 22′ 00″]
Bombay Church ...	... 72° 55′ 13″	...

Colebrooke replied,

Although...I cannot suppose that Mr. Goldingham has been far from the truth, yet I do not think that his deductions are so correct that the Longitude of either as given by him can...be depended upon as an Unerring Standard, from which the Longitudes of all other places in India should be calculated. ... Some new lights may be thrown on the subject by a comparison of the Greenwich Observations with those which have been taken at the Madras Observatory since the year 1790. I take the liberty of transmitting for this purpose a duplicate set of Dr. Maskelyne's Observations, ... consisting of the 3rd volume and two numbers for 1799 and 1800, which Mr. Goldingham not being yet in possession of, I request you will forward to him.

I have every reason to believe that the true Longitude of Fort St. George will be found between 80° 16′ 30″ and 80° 21′ 43″ as stated by Mr. Goldingham, the difference being only 5′ 13″[5].

[1] B Pol C. 10-7-1800. [2] DDn. 47 (1-15). [3] by Topping 1793-6 [105-6]. [4] by Goldingham [177].
[5] BPC. 21-4-1803.

CHAPTER XII

PROFESSIONAL METHODS OF SURVEY

Rennell in Bengal, 1764–77 — Route Traverses — Madras Jāgīr, 1767–74 — Michael Topping, 1788–94 — Bāramahāl & other Madras Surveys, 1792–9 — Madras Surveying School, 1796–1800 — Journals & Fieldbooks.

WHEN Rennell reached Bengal at the age of 22, he had been some 8 years at sea, and had gained considerable practice at the surveying of coasts and harbours, with a certain amount of instruction from brother officers.

Most of his assistants appear to have had some knowledge of surveying before they came to India; for he seems to have had no opportunity of a personal meeting with the majority of them, and in such instructions as have been found, he assumes their knowledge of how to run and protract a compass traverse.

From his Journal of 1764–67 [17n.11], and a study of the large-scale river surveys of his first year's work, we learn a good deal about Rennell's own methods. His instruments included a Hadley's quadrant [199] and at least two chains; he had a compass, and took astronomical observations to find its variation; he procured later a sextant and a theodolite. For his river surveys he surveyed the banks by chain traverses, and the intersection of prominent bends and points with his quadrant, and took occasional observations for latitude. He occasionally checked the length of his chain, recording errors up to 8 inches excess [198]. He left marks at the end of each length of survey, which he picked up on re-starting.

Throughout his first river survey he distinguished between *cursory* survey by way of reconnaissance, and the *exact* survey which he made of any channel which might give him the route to the south for which he was searching.

He appears to have kept up large-scale protractions day by day, at first on the scale of 4 inches to a nautical mile, but later on that of 2 inches to a mile [247]. He changed over to British miles later.

Hirst gives the following note on the first sheet of the Ganges survey of 1764 [18];

> The map shows some, but not all, of the triangulation and other stations used; here and there are double lines which were bases measured with more care than other lines on the map. The methods by which the map was constructed can, however, be gleaned from the map; first of all a base was measured near Jellinghi[1], and a traverse was run from it to the Damodar end of the map; wherever the traverse crossed deep water triangulation was resorted to, and here and there fresh base lines were measured. From points on the traverse, bends in the river banks and village sites etc. were intersected. ...
>
> The traverse is sometimes on one bank and sometimes on the other. In many places notes are made where the work is not exact[2].

When Rennell first started his surveys on land he appears to have had no system of running traverses in circuits or checking them by cross lines, nor does he appear to have any regular system of astronomical control. His earlier surveys were aimed to complete some definite length of river, or the route to some important place, or a major boundary. His surveyors were given certain vague areas to survey.

As he gradually gained a better knowledge of the geography of the country he was able to give more precise instructions to his surveyors, and these appear to have been in the form of orders for running carefully measured circuits through places

[1] Jalangi, 78 D/12. [2] Hirst & Ascoli (4).

of importance, with other lines of *cursory* survey [35–6]. The following extracts are taken from instructions issued at the end of 1776;

You are hereby directed to compleat the general Survey of the Jungleterry [34 n.9] etc., observing the same rules for your conduct as you followed during your former survey, viz., to lay down the direction and length of the principal roads, the course of the principal Rivers or Nullahs, and to describe the face of the country in general, by distinguishing the Hills, woods, jungles, morasses, arable sands, and to remark the situations of Forts, passes and gauts, as well as every particular as may appear worthy of remark. ...

[Then after a list of routes to be followed], you will please to observe that only about one seventh part of the whole distance is to be measured, the remainder is to be estimated, according to the method you sometimes practised heretofore. Your surveys are to be drawn on the same scale as formerly, viz., 2 miles to an inch[1]. ...

You are hereby directed to proceed on a survey of the unexplored part of Ellahabad, Oude &c. ... You will herewith receive a list of the Roads, etc., that you are to survey, to which you must conform as nearly as Circumstances will permit. ...

According to the list of Routes, the point of commencement of your survey is at Secunderpour. You are to trace the Road from thence to Buxar & Benares. I know not on which side of the Ganges the principal Road lies; but it will be your business to enquire, and act accordingly. ...

If escort is provided you will proceed from Benares first to Biorigur Fort, and then in a direction nearly south till you come to the extreme limit of the Benares District; and having found the Boundary, chuse such a route westward as will enable you to describe the course of it, till you close the said Boundary at, or near, the village of Gorah[2], which is represented in Mr. Bruce's survey as lying on the frontiers of Chandail[3] (the territory of the Rajah Gobind Singh).

Then follow detailed instructions as to tracing boundaries, marking villages, passes, depths of rivers, and making junction with other surveyors;

It is not meant that you should follow the boundary through all its minute windings, but with such a degree of exactness only as may be expressed in a map of 5 miles to an inch.

Some roads were to be "measured in a cursory manner", others by actual mensuration, in order that I may be able to connect your former Survey with Capt. Marsack's. ... Your surveys must be laid down on scale of two British miles to an inch: they must be regularly numbered, & put to paper as soon as possible after they are taken, lest, in case of accident to your Baggage, we should lose the fruits of your labours. ...

In your plans, the general face of the country is to be described, whether Hills, Woods, Jungles, swamps or arable sands; the classes of towns, villages, Forts, &c. must be distinguished by proper marks; and the passes, gauts, Fords, and Ferries must be noted[4].

For the measurement of distances perambulators were generally preferred to chains;

To show that long distances *may* be accurately measured by a perambulator, I need only mention that during the Bengal survey I measured a meridian line of three degrees with a perambulator, and found it to agree minutely with the observations of latitude [152]. However, due allowance was made for the irregularities of the ground, wherever they occurred[5].

Though triangulation was quite out of the question for his survey of Bengal, Rennell fully appreciated its value for the hilly country of the peninsula [89]. He complains bitterly about the lack of information given by early surveyors about the construction of their maps; indeed, few surveyors ever thought to put their names or even a date on their surveys or fieldbooks, quite apart from the professional information Rennell wanted;

It should be a rule observed in all plans, to note how the scale was obtained; whether by actual measurement; difference of latitude; or estimation of distances; to which may be added, that the meridian line or parallel should be drawn across the whole space in the plan, to prevent errors in measuring the angles of bearing[6].

It may be fitting here to refer to Dalrymple's *Essay on the most Commodious methods of Marine Surveying*, written by him before 1765 and revised and published in 1771[7]. Dalrymple had his first lessons in navigation and marine surveying from Thomas Howe, in whose ship he sailed for Borneo in 1759, and Rennell had spent

[1]To Pringle; BPC. 5–12–76 (A). [2]Kora, 63 B/8. [3]Chandels, petty Rājas of Bundelkhand, *Imp. Gaz. U.P.* I(214). [4]To Dawes; BPC. 5–12–76 (C). [5]*Memoir*, 1783 (66). [6]*Memoir*, 1793 (25 n). [7]cf. methods recommended in 1784 [190].

nearly a year as Dalrymple's surveyor during his second voyage of 1762–3. The following are extracts from Dalrymple's essay;

The Basis of all Surveying is in determining a Distance, for unless some Base is found, or assumed, no Chart can be made. ...

Experience has fully convinced me, that Bearings taken by *Compass* cannot be safely trusted to in making a correct Draught. I have found not only a Difference of 3° or more in different Compasses, but in the *same Compass* at different times; I do not say the *Effect* had no *Cause*, but there was no sensible one which I could discover: And I have heard other people say their Observations gave room to believe there is a *casual Deviation consequent to the State of the Atmosphere, or some other occult influence.* ...

Hadley's Quadrant is as much preferable to the *Compass* for taking Angles in Facility, as Exactness. In the common Observation for finding the Latitude, the Hadley being held upright. ... For taking Angles, the Hadley is held horizontal. ...

Capt. Plaisted's Practice of using, for determining the Course and Distance in *Soundings*, a Lead instead of a Log to his Line (the stray Line corresponding to the Depth of Water) seems to be a good Method of correcting the log.

In another place he writes;

It is not pretended that *any* of these *Charts* are *Surveys*, according to my idea of the word *Survey*; by which I understand "a Chart where *everything* is *minutely* and *accurately* laid down, so that there is no room for *additions* or *corrections*". But such works very seldom appear, and I have seen some *Charts* very defective and erroneous, which the Editors have thought proper to call *Surveys*. ... But an *implicit confidence* is what no man is excusable for placing in any Chart, and I exculpate myself from all consequences which may proceed from such misconduct[1].

Of map reproduction he writes,

It is almost impossible to get a chart entirely exact from the impression of a copper-plate; besides those errors in the original to which all human performances are liable, there are many peculiar to engravings; the unequal shrinking of the paper; and the great difficulty of having a drawing traced exactly on the plate is another[2].

ROUTE TRAVERSES

As might be expected, it was only practicable to undertake deliberate surveys, such as Rennell carried out over Bengal, over territory which had been formally ceded to the Company. The only means of acquiring knowledge beyond these bounds was through the marches of troops or political missions; and before about 1790, except for Charles Reynolds, special journeys for the particular purpose of survey were hardly thought of.

A large part of Rennell's *Map of Hindoostan* was filled in from travellers' journals which gave nothing more than a rough estimate of the distances travelled; these were more useful when a record was kept of each day's march and its general compass bearing [10].

Most of Pringle's road surveys in the Carnatic record each day's march to the nearest quarter of mile and gave no bearing whatever. The trundling of a perambulator was a simple matter, but the continuous recording of the windings of a road, especially when the greater part of the march was made by night, would have been most difficult. In his later work Pringle supplemented his road measurements by bearings taken from hill tops, and occasional observations for latitude, but in the main the military road surveyor gave little thought to the general geography of the country, and concentrated on the measurement of distance.

Where perambulator measurements were impossible, as through thick jungle, time was noted by the watch and converted to distance by the estimated rate of march [75–6]. Such computation was always employed when travelling by boat. The more experienced surveyors made a regular deduction from their measured distances to allow for the unevenness and winding of the roads, and also, in hilly country, to reduce the measured distance to the horizontal [188].

[1] *General Introduction to the Charts & Memoirs*, 3rd edn. 1787 (viii). [2] *Memoir of a Chart of the Southern Ocean* (2), Dalrymple.

Rennell notes that when using any route distance for map compilation he deducted one eighth part for distances of 100 miles, and one seventh for distances of from 200 to 300 miles, and conversely,

Those who wish for a general rule for changing horizontal distance into road distance in their common references to maps may break the line of distance into portions of not more than 100 or 150 miles, and then add to the whole sum of distances so obtained, one eighth part[1].

Those surveyors who had the necessary knowledge and instruments took observations for latitude, and for variation of the compass, at frequent intervals [155]. There was however no regular school of surveying [267], nor any one co-ordinating authority, and each surveyor was his own master until Colebrooke, after he became Surveyor General, tried to introduce some regularity of method [187–8]. Extracts are now given from the journals and reports of various surveyors.

In describing his survey of 1775 [30–1], Smith discusses the danger of carrying out a long line of survey by perambulator measurements without regular observations for latitude and longitude;

The best way is to join both these methods together by making astronomical observations at the end of every day's measurement, and thereby correct the measures by the chain of perambulator, and also the Bearings by the compass; all this may be done and the survey of the whole country taken in the most private manner, without the knowledge of even so much as a person's own bearers or servants, and at the usual rate of travelling in a palanquin, which is about ten times as expeditious as any method yet practised, by means of the following contrivance adapted to a palanquin.

He then describes, with a sketch and full mechanical details, the fitting of a wheel trailing along the ground beneath the palanquin, connected by a rod and endless screw to a cyclometer which could be read by the surveyor whilst seated comfortably inside. There is no record of this ingenious device being adopted by anyone else, and it is by no means certain, either, that Smith really put it into practice, for he writes,

Not only the places upon the road are inserted, but all those in view from the road, with their bearings by the compass, and their distances by estimation. Indeed all the distances were obtained by the same way, from the rate of travelling per hour, which in general, correspond so well with the Latitudes and Longitudes taken each day, that they cannot be much wrong. ... The point of the compass following the name of a nullah or river, shows the direction of its course, and sometimes that of its current[2].

Colebrooke's survey along the east coast in 1784 fully deserved Pearse's praise [41–2]. His fieldbook gives perambulator measurements for each day's march, and for many branch lines to the coast and important places off the line of march; where opportunity occurred bearings were taken to conspicuous hills, or short base-lines laid out and points fixed "by trigonometry". Astronomical observations for latitude were taken at almost every halting place[3].

The later Madras surveyors, including Schlegel, took full advantage of hills along their routes, and by intersecting hilltops were able to check their measured distances. In describing his surveys with Fullarton's army during 1783 [98], Kelly refers thus to the work of the average route surveyor;

A pocket compass and watch are the sum of his apparatus, and if he guesses within half a point of the bearing, and half a mile of the distance, of one village or encampment from another, he is allowed to be very accurate in his observations [28].

His own methods were different; he fixed the latitude and longitude of Madura by repeated observations, ... which observations correspond exactly with its bearing and distance from Trichinopoly by several routes, measured carefully with a Gunter's chain, and the angles taken with a complete theodolite. ...

The road...has been carefully measured with a chain, ... and the bearing taken from village to village with a well-graduated theodolite, the whole corrected by the intersections of large triangles formed by the peaks of every remarkable hill, Pagoda, or other object discoverable in route; ... all these surveys further corrected by astronomical observations[4].

After describing his traverse from Ongole in 1783 [100], Lennon continues,

This road is laid down particular exact, for I traversed it four different times, and always found the bearings and distances to correspond.

[1] *Memoir*, 1793 (7 n). [2] Journal, BM. Addl. MSS. 29213. [3] Fdbks. DDn. 2 & 4. [4] BPC. 28-6-84.

The rivers I took particular care in tracing, and ascertaining their exact courses. The Mussy I crossed in about ten different places, and of the few parts that I did not actually trace, I had a view of its windings through the whole extent. ...

The roads...were laid down at the time, according to the Proportion of 8 and $8\frac{1}{2}$ English miles traversed by the perambulator, to 7 horizontal miles of the same kind; varying the proportion, within the above bounds, by the diversity of the roads [1] [188].

Of his survey of Guntūr in 1788 [111–2], Mackenzie writes,

The great number of remarkable hills and Pagodas facilitated very much a survey of this kind, but...on the Ongole road this help was much wanting, as the road goes there through thick groves of Palmyras, in a level country near the sea, where the sight is much circumscribed, and a view of the mountains can be rarely obtained. ...

The situation of some remarkable objects near Nellore were ascertained by an actual survey of the environs of that place; the principal are certain named Pagodas and rocks; the road to Seropilly Fort was accurately measured by the chain, and the distance of upwards of 11 miles, from Nellore to Seropilly, formed the base for the angles taken of various points, and several remarkable hills in the Western Chain, which may be clearly seen from Nellore and served to correct the distance run by the perambulator.

This foundation being laid in August 1788, I measured the road from Nellore...following the windings of the road, minuting the distance at every change in the direction and country, correcting the small errors, which unavoidably arose from the pocket compass used, by bearings taken at every convenient station with the theodolite, of those remarkable objects mentioned already, and of others which occured in the course of this survey. ...

In protracting the measurements on the plan, I laid down each small distance according to the bearing of compass, and afterwards corrected them by the stationary bearings, so that the distance on the plan may be reckoned horizontal, the road of winding distance being in the abstract of the routes annexed.

I also took sketches of the outlines of the remarkable hills, which served to make them known to me when viewed afterwards from other quarters; some of these may be distinguished at upwards of 60 miles [2].

Surveyors working in the Ganges valley had, however, to depend entirely on measured distances and astronomical observations. Here are notes from Colebrooke's journal of a survey near Cawnpore in 1788;

November 2nd, marched about 11 miles in a palanquin. ... Traverse table gives the bearing of the road by compass points, thus, NNW.; NW. by N.; ... Time is given to the nearest minute all along the road, with difference of time between villages; ... distances are computed from these intervals of time. ... Remarks on each village and stream that is passed.

This estimate of distance is deduced from the time of travelling in a Palanqueen, and I have found by several trials that the average rate in 4 miles per hour when the road is tolerable [39]. ...

Total difference of time $4^h\ 21^m$. This at the rate of 4 miles per hour would produce $17\frac{1}{2}$ miles nearly, but as the bearers were latterly a good deal fatigued, and went slow, I allowed only the rate of 3 miles per hour. Result 16 miles. ...

The distance (six furlongs) is guessed from Begum Serai. The road was so difficult that it could not easily be computed from the time.

Astronomical latitudes were taken almost every evening. The fieldbook contains occasional neat little plans, with no indication of scale, obviously to assist in the protraction later on. It also contains records of routes measured by perambulator; some of these measurements are made without the direct personal supervision of the surveyor, who discusses various discrepancies noticed [3].

It was usual to protract each day's work on fairly large scale; Emmitt notes,

I protracted the rough copy of my surveys with a circular protractor 4 inches radius, having nonius and double prickers [4].

Burrow describes his protraction thus;

The routes may be so easily laid down in the manner of traverse sailing, by using the differences of time for the distance and the course as usual, but though I had calculated most of them, I found it was just as easy to lay them down from the original observations as from the results, and therefore I left the results out; that is, first lay them down on a separate piece of paper, then reduce them to the proper scale from the given difference of Latitude

[1] *Oriental Repertory*, I (53). [2] ib (57). [3] Journal, DDn. 7. [4] Bo. S & Pol. 23–11–92.

and similar figures, and then protract the result into the map; or it might be done by taking the mean rate that the camels travelled for the measure of the real distance in the given time[1].

Here is a note by Colebrooke regarding his survey in Mysore during the war of 1791–92;

In marching, the direction and turnings of the road were observed with a pocket compass, and, whenever a village, tank, or any conspicuous object occurred, or the road altered its direction, the distance given by the wheel was carefully noted down. The same was done whenever the theodolite was used. Separate Protractions of each day's march, upon a scale of one mile to an inch, in which, besides what was allowed for crooked roads, a reduction of 1/30 was made for the inequalities of the ground and the unsteadiness of the man who drove the wheel, enabled me to ascertain nearly the direction or horizontal distances, which, being then corrected, were applied as Bases in the protraction of the map[2].

A striking feature of Colebrooke's fieldbooks in Mysore was their illustration by artistic panoramas, drawn in pencil and colour wash, with bearings to prominent points which would be of the greatest assistance in recognition and for protracting the map [188][3]. Similar panoramas and sketches are found in a fieldbook of Mackenzie's, who was not, however, such an artist as Colebrooke[4].

Here is an extract from Davidson's journal of 1790 [42];

The distance of our journey is computed according to the measurement of the country, and reduced to the English standard by our own practical knowledge and the time occupied by each day's journey. The course is occasionally regulated by a pocket compass, but I had a greater dependence on observing the position of the sun, moon, and certain planets. ... Total distance 565 miles.

This is unlikely to mean that he took astronomical observations, but rather that he judged the general bearing of the road by watching the sky, most of the marching being done at night to avoid the heat of the June sun [41][5].

The Surveyor General entered the following note in the journal,

The distances have probably been overrated, and probably did not exceed 500 miles. The rate of 3 miles per hour allowed...was too much in hilly country, where considerable Jungles intervened[6].

Emmitt's description of his survey with Little [128–30] shows that the Bombay surveyors were in no way behind those of Bengal and Madras in the care taken over their measurements; he

observed the latitude of the mouth of the Jayghur River; ... the windings of the river Major Sartorius gave me, the bearings of which he took with a good compass measuring the distance with a "log". ...

At Cordona I began the survey, carefully ascertaining a connection of stations in the direction of the road, the bearing of which I took with a good sight compass, regularly entering them in a Field Book, together with offsetts to villages, Hills, Tanks, and wells, or any other object worthy of notice, measuring the distance between each station and offset with a good perambulator; in crossing of Rivers or Nullas I noted down their distance, measuring straight from station to station, by which method the line of Survey served me for a base, whereby I ascertained the distance of more remote objects, such as remarkable parts of ranges of Hills, Forts &c. by taking two or three bearings of them from different stations in my line of survey.

I protracted the survey daily on a scale of five statute miles and a half and three hundred and twenty yards to an inch, taking the distance from a diagonal inch scale answering to ten thousand yards, which enabled me to lay off a distance correct to fifty yards or even less. ...

The scale of my surveys is four and a half inches the equatorial degree, which was approved of by Captain Kyd [112]. As the Paper on which I had to make my copies was very indifferent, I have...given a correct List of all the Towns in their regular order of survey, lest a difficulty might arise in making out some of the names[7].

From the time that Colebrooke became Surveyor General he gave every surveyor detailed instructions as to his method of survey, extracts from which are now given. To Blunt for his survey of 1795 [59–63];

[1] IO. Maps, MS. 5. [2] MRIO. 138 (41). [3] Fdbk. M. 120. GBO. Lib. Ab. 86; *v.* instructions to Blunt & Mouat [188]. [4] Fdbk. BM. Addl. MSS. 13582 (19). [5] Leckie (50). [6] BM. Addl. MSS. 13588. [7] Bo. S & Pol. 23-11-92.

The particular mode of carrying on your survey you are, I trust, sufficiently acquainted with; I have therefore little to add on that head. I would however recommend to you to lay down your work upon a large scale, protracting each day's work upon a scale of one British mile to an inch, and deducting 1/30 for the unevenness of the ground and the unsteadiness of the man who drives your wheel; a reduction of 2/30 may be made when the road is very rugged and full of short turns and...windings that you cannot ascertain by the compass. ...

Your distances thus corrected become so many bases which you may apply to the construction of your General Plan, which should not, I think, be laid down on a scale less than two British miles to an Inch.

It is advisable also to make rough sketches of the hills in your Field Book, which will greatly aid and assist you in the protraction and finishing of your plan. ...

As your route will lie directly through the country, it will not, of course, admit of your furnishing a complete map by survey. It will be useful, therefore, to take down from the Reports of your guides and Harcarahs, the Directions and distances of such places of note as are out of sight, and these you can afterwards shew in a reduced copy of your work[1].

Similar instructions were sent to Mouat in Rohilkhand [56, 168], adding,

It is needless to add that frequent angles and bearings must be taken with a Theodolite for remote objects, and with Pocket compass for the direction of the Road, in doing which it will be advisable to note every object that can tend to render the plan interesting and useful, making also a rough sketch of the country as you travel, and estimating by the eye the distances of such villages, Topes, &c. as are near the road, or not very remote.

In taking angles with your Theodolite it is proper to draw the appearance and shapes of the Hills &c. in your Field Book, instead of denoting them by *a, b, c,* or any other marks, by which means you will be enabled to observe them again, without which...their distances cannot be ascertained[2] [187].

To Hoare who was to survey the Jumna from Allahābād to Delhi [57, 168],

I would advise you, so far as the river may be navigable, to travel by water, with a perambulator driving along the bank and keeping pace with your boats. When you arrive at any town, fort, or Gaut, it will be easy for you to step out of your boat and look at the wheel, and the intermediate distances may be known by a time-keeper or a good watch, which if your boatmen are made to keep an even pace, may be calculated by the rule of proportion. I would, however, advise you to observe the wheel as often as possible, and for the greater accuracy of your survey to proceed slowly, and not to be over-anxious to make long journeys.

The direction and bearings of the River may be ascertained with sufficient exactness by a compass; but a Theodolite will be necessary for nicer observations on shore. If you can also observe by Astronomical observations the Longitudes of two or three principal places, your work will be complete[3].

On receipt of Hoare's first field book, Colebrooke makes the following criticisms;

The specimen transmitted by you appears in some respects sufficiently satisfactory, the distances being marked with minute preciseness; but I beg leave to observe that all the Angles being only given to points of the compass, it will be difficult for you to project your work without running into considerable error.

I beg leave to remind you that in my instructions I mentioned that a compass might be sufficient to ascertain the directions and windings of the river, but that a theodolite would be necessary for nicer observations on shore. It does not, however, appear that you had used one, but even with an Instrument of the former kind you might have marked the bearings of distant objects with greater precision, and by observing from time to time the Sun's Amplitude or Azimuth, the variation of the needle might have been found, so as to render your sights sufficiently correct for the common purposes of Geography[4].

Colebrooke himself spent much time surveying the Ganges and other rivers, so there was eventually very little that he did not know about survey as carried out from a boat. Several of his field books are still preserved. His traverse form is ruled with four columns; the two side columns contain notes of places and conspicuous features on the left and right banks. The first centre column gives bearings, which are sometimes simple points of the compass, and sometimes have

[1] DDn. 16 (60), 4–12–94. [2] DDn. 16 (63), Dec. 1794. [3] DDn. 16 (83), 10–4–95. [4] The Surveyor General of 1796 was indeed a *polite letter writter.* DDn. 16 (135), 12–9–96.

the bearing to the nearest degree or half degree, recorded with compass quadrant, thus N 49 W. [201]. The second centre column shows hours and minutes, for calculation of distances [196].

There are occasional tables of "angles with theodolite", taken to the nearest minute to prominent objects, often with no indication of the position of the theodolite. There is often a round of bearings taken from the top of the budgerow, with distances run to the objects by perambulator, and with notes such as

there was a creek in the way, which prevented the wheel being driven in a very direct course. ... The clasie[1] says he drove the wheel pretty straight, and only lifted it up in one place, about one furlong, to cross an inlet where the water was deep[2].

Wood writes to the Surveyor General in 1799 [58–9],

I have made considerable progress in my protraction, beginning at Nawabganj up to Baraitch, as, being a good deal in a northerly direction, and having observations for latitude of these and several intermediate places, the necessary correction I find by these means, and what you mentioned to me in one of your letters when I was in Assam, answers very well: viz, 1/30, and when the road is broken, 1/15. I have adopted the mode yon recommended, and am protracting on a scale of a mile to 3/4 of an inch: you mentioned an inch to a mile. ... Afterwards I propose reducing it to a scale of 4 miles to an inch, and on this to lay down Don's tract, which I will protract myself[3].

MADRAS *JAGIR*, 1767–74

The instructions given to Thomas Barnard for the survey of the Madras *jāgīr* in 1767 [88, 141–2] provided for a full and detailed survey, scale two inches to a mile, of an area about 100 miles by 50. He had only reached Madras the year before, aged 19, but had received a good mathematical education at the Royal Military Academy, and from his account of the manner in which he tackled this formidable task had fully mastered the principles of geometry and surveying.

The Country is laid down from angles and measurements performed with the Theodolite and Chain. From Madras to Tripasoor[4] Westward, and from that line to the extremity of the Company's Territories Northward, the Country is quite level, ... having in all this part no elevated Situations to afford the means of correcting such errors as are unavoidably... contracted in Surveys of any extent.

I judged it to be the best way to divide the whole into Circuits of 12 or 14 miles. These circuits were contrived so as to afford the most convenience for getting the situation of the remarkable objects within them, and to give the greatest possible length to the lines which formed them; the fewer stations there were in each circuit, the more correct the work became, by diminishing the number of angles to be taken, in which the danger of error is greatest.

The finishing of each circuit corrected the mistakes of the preceding one, as there must always among the adjoining Circuits be some common points belonging to both, and of course if the work should be perfect they must coincide.

From the lines which formed these Circuits the Angles were taken to the villages as I measured along. In those villages where no conspicuous object presented itself, the want was supplied by a flag on the top of some high tree. ...

The plan of the villages, the situation and shape of the Yaries [Tanks], were determined by their bearings to the above point. ...

The situation of the paddy fields being almost always contiguous to [the tanks ??], the same work which gave me the place of one, afforded likewise the place of the other. ...

When the whole of the afore-mentioned tract North of Madras came to be closed, and the circuits brought together, I found a considerable error had accumulated; the extremities of the work which ought to have joined, did not meet within a mile; this I have been forced to accommodate by diffusing it in small portions over the whole, so that each part shall be as nearly in its proper place as possible and none be put much out.

I have only to offer in excuse for this error, that no pains were omitted to avoid it; it must have happened by errors in the angles or lengths, tho' with respect to the latter, I was not above the task of holding the Chain myself; and in the course of all the above work my health enabled me, and a desire to do my duty throughly prompted me to it.

[1] *Khalasi* [289]. [2] Fdbk. M. 482 (a), DDn. 13. [3] DDn. 15 (77), 6–6–99. [4] Tripasur, 57 O/16.

With regard to that part of the Survey containing the Imaum Lands [133] south of the above Western line from Madras, I give that up to the strictest Inspection; the many hills in it afforded me the means, and I made use of them, to correct all the incidental errors. I have accompanied with the Charts, the angles taken from the several Stations on those hills, as affording an easy opportunity of reference, upon any occasion that may occur[1].

This was indeed a remarkable piece of work to be undertaken without the advantage of professional textbooks, or departmental rules, and with the simple instruments of the period; a work that would do credit to any young officer of the twentieth centuary. The lay out of his traverses in closed circuits; the distribution of his closing errors; and the connection of his traverses to the basis of triangulated hills where these were available, are principles which stand to this very day.

Triangulation appears to have been used as the basis of the large scale survey carried out by Dugood in 1776 [142–3], when he observed from "13 Principal Stations", and submitted the "computations of a considerable quantity of Capital angles" taken from them[2].

MICHAEL TOPPING, 1788–94

In December 1784 Dalrymple submitted to the Directors a *Memoir concerning a Survey of the Coast of Choromandel* [164], recommending that "it will be very proper to take the present opportunity to make a compleat *Survey* of *It*", and describing the methods which he suggested.

Flags should be set out on shore, arranged either in triangles or in lines of three, and their positions fixed by an observer on shore working with a Hadley. The surveying ship, would lay down lines of soundings from the flags on shore, and

the Persons on board the Vessell [should] take frequent *Views* of the *Land*; ... those *Views* should have the *angles* of the *various Objects* taken with a *Hadley*, as well as their *Altitudes* marked, which will be of use in making a *Map* of the *Country inland*, as well as for the information of Navigators; But although it may be *useful* in making a *Map*, Angles taken from Sea, with any Instrument now made, cannot be considered as equivalent to Geometrical Survey. ...

Perhaps it would be eligible to leave a short trunk of Bamboe, sunk in every Place where a Flag-staff had stood, as it would facilitate the repetition of any angles which might hereafter be wanted. ...

In case any part of the *Coast* is woody down to the Sea-Side, The Flag-Staffs must be fixed on Trees, and the angles, taken, with the Hadley, from the elevated branches of the Tree; which I have practised where the Objects could not be seen from below[3].

It is possible that Topping may have discussed these matters with Dalrymple before he came out to India; anyhow it is interesting to compare the methods which he actually used to carry out this survey;

In 1787, Sir Archibald Campbell, entirely satisfied with the observations I had made for determining the Latitudes and Longitudes of places between Masulipatam and Calcutta, proposed...that I should continue those operations *Southward* [102]. ... Sensible, however, that such a process (superior as it was to former method of surveying) was still inferior in exactness to what *might be* done; and not willing to lose so fair an opportunity of introducing the most correct stile of surveying hitherto invented into this country, I proposed the *Trigonometrical Mensuration*. Chronometers I well knew, however excellent, were liable to accident and failure; and tho' the best expedient for settling the positions of places *not very distant from each other—at Sea*—yet *on shore*, where a concatenated series of Triangles could be effected, such a process was to be preferred to every other mode, not only as the most exact of any, but as a method which, when once excuted, absolutely precludes the necessity of every other, being founded upon Geometrical certainty and truth.

Were these Triangles carried throughout India (as they might have been at a much less expence than has been incurred to make bad maps), the Geography of the Company's Territories might soon be rendered compleat; and surely bad methods should be laid aside when good ones can be adopted; for *one good Geometrical* survey of a Province, or line of coast, is sufficient; whereas after *ten bad ones* the work requires to be gone over again[4] [193].

[1]MRO. Map 20; note 1-12-74. [2]MMC. 6-1-77. [3]Ritchie (1-8). [4]MPC. 2-12-91.

He thus describes the details of his triangulation ;

The angles are all taken with my Hadley's sextant made by Stancliffe, by means of 3 tall signals I have constructed of Bamboos 80 feet high, 60 of which I mount upon steps, so as to see (over all trees etc.) very distinctly my two other signals, at the distance of from 8 to 13 miles[1] [102, 192].

It is, I believe, the first time the Hadley was ever made use of for a purpose of such magnitude ; but it is fully equal to it—nay it does more—; The sun's bearing...from my signals is also taken by it, by which, and his azimuth (computed), I obtain the angles made by them with the meridian, and by combining the whole, the difference of Latitude and meridional distance of every one of them in English fathoms. This is found so nicely that a mean of my astronomical observations for the latitudes never differs more than a few seconds from those given by the Geometrical mensuration[2].

He measured a base-line upon the sea-beach near Porto Novo[3] in May 1788 ;

This Base Line, could I have chosen its situation, should have been determined as near the middle of the line of Coast I am surveying as possible ; but circumstances have not permitted me to make unrestrained choice of its place.

On my arrival at Cuddalore, I was told that, as I proceeded southward, I should meet with frequent rivers and other water courses, that would certainly obstruct me in the design I had formed of measuring it on the sea-beach further south ; and soon after my removal from that place, I found, with much satisfaction, that the Coast between Cuddalore River and Porto Novo would serve my purpose extremely well. The Beach here-abouts is flat, broad, and remarkably smooth, ... but forming a curved line, concave towards the Sea. ...

An accident that about the same time befel one of my signals, and delayed my Trigonometrical progress, ...determined me to measure my base at this opportunity, and I accordingly began that work by placing two of my Large signals...about 7 miles asunder, for the...extremities of it. ...

[I] divided the whole distance into 6 distinct portions, each portion forming a small angle with the next. ... Measurement ; ...spared neither pains nor care. The 2 rods of 25 feet each which I had provided for this use, had been strictly examined while I was at Cuddalore, and their lengths ascertained ; ...they had been left *purposely* a little too long, as I found it easier to determine and allow for such excess, than to reduce them to sufficient exactness.

Used a capital 2 feet Brass Sector by Adams as a Standard. ...

The stands which I had prepared for levelling the rods were also brought out ; and it was with much regret that I found I could not profit by them, as I hoped to do, assisted as I was by none but Black people, in whom I perceived it would have been impossible, without incurring great loss of time, to have impressed a necessary idea of their nature and management [290].

He laid the rods end to end along the ground, which he thought was just as satisfactory as the French base which was measured on " the rugged pavement of a highway near Paris ".

He gives details of the measurement, the determination of azimuth, the connection with his triangulation, and the meridional observation of stars for determining the latitudes of the terminals, whose position with relation to neighbouring marks he describes minutely.

The following year Topping was engaged on his survey of Coringa Bay [103] ;

The capital letters of reference show the positions of my signals for ascertaining the leading points. These signals...were of the kind used by myself last year. ...They were constructed of the largest bamboos that could be got, so put together with iron cramps, and supported with rigging, as to admit of my ascending to the height of 60 feet upon them, and thence seeing over every obstruction round me on this *flat, woody* country.

My Instruments were screwed upon an apparatus fixed to the top of each signal (I mean in particular my Hadley, with which almost all my angles were observed), and the whole could be readily elevated, taken down, and transported from place to place.

By means of these signals, a sufficient number of connected triangles were obtained ; the sides of which were computed, and thence (not by the usual method of protracting) the principal points were established on the Chart. ... The Base-line, or foundation of the whole, was measured as accurately as possible on a spot very convenient for the purpose, with two rods, constructed on a similar occasion last year. ...

[1] cf. trestles & masts described & illustrated in *Records of Survey of India*, 1916–7 (42–7).
[2] Topping's Report, RS. Lib. MS. X.2. & *Phil. Trans.* 1792 (99–114). [3] 58 M/15.

Pages — — give particulars of the method used for determining the configuration of the shores of the Bay. A great part of them, being low and overgrown with jungles, was inaccessible, and gave me much trouble. Such parts, however as would admit of it, were measured with the Perambulator and Theodolite.

He then describes his method of taking soundings,
following a practical application of Mr. Dalrymple's problem (founded upon the 21st proposition of Euclid 3rd) for determining the place of an observer in possession of the angles made by any three known points[1].

Goldingham gives the following description of the triangulation which he carried up the coast to the north of Madras, in 1792–3, under Topping's directions [104–5].

Two signals 60 feet high each were raised at two stations by the sea-side; on the Southernmost of which the observer could elevate himself between fifty and sixty feet from the ground, while the northern signal was distinguished by two large flags (a blue and a white one); the distances between these signals were so regulated that the flags upon the foremost could be plainly seen by the hinder one, tho' placed from 8 to 16 miles asunder.

The observer, elevated upon the hindermost signal any time between sun rising and nine o'clock in the morning, or between 3 o'clock and sun setting in the afternoon, with a Hadley's sextant, took the distance of one of the limbs of the sun from the foremost signal, noting the precise time of the observation; from which the true bearing of one signal from the other was computed: to make the work more correct, instead of one distance, six were generally observed, and the bearing reduced from the mean of these. ...

The latitude of the Southernmost signal was then found by the mean of 16 or 20 meridional observations; and, in order to remove any error that might arise through the imperfections of the instrument, half the sights were taken with objects on one side of the zenith, and half on the other side. From this data, the difference and distance of Longitude between the two signals were obtained.

The hinder signal was then moved forwards and raised precisely in the station where the foremost stood; the foremost signal was carried on, raised, and the operation repeated; in this manner were the situations of the principal signals found.

The accuracy of this method in a survey of a coast situated, as this mostly is, in the direction of the meridian, when the precautions before mentioned are taken, can hardly be questioned.

The line of the coast between the two large signals was laid down by a circumferentor [201] and perambulator, with the assistance of smaller signals. The declination of the needle was found from time to time to correct the bearings by the circumferentor, and the error of the perambulator was ascertained[2].

And finally we give Topping's description of his survey for the Kistna-Godāvari Irrigation project [106].

The levels were all taken with an excellent Instrument of Mr. Ramsden's construction, at short sights for the most part of 150 yards each: the Instrument had indeed powers adequate to observing at much longer intervals; but besides that short distances, in these kinds of operations, give a more accurate result than can be derived from more distant observations, I found it altogether impracticable to take very long sights, attended as I was by Natives only, whom I had no small degree of trouble in training to a co-operation with me even at these very convenient intervals [191].

To render a series of observations, obtained with so much toil, as *permanently secure* and useful as possible, I fixed large Blocks of stone...at convenient intervals on the Bank of the River; and to these the station staves were in order applied, that their difference *in level* might be ascertained. These *Stone Terms*, which are six in number, are denominated *Permanent Terms*; and their several positions are marked explicitly on the chart[3]. ["Many of them being under ground"]. ...

The Angles and distances...were all accurately measured with a very good instrument; ...the islands between its banks, and the numerous Villages situate upon them, are laid down with every attention to exactness. To render the whole useful in a Geographical as well as Political sense, many observations of the Sun and Stars were taken, both for establishing a scale of Latitudes probably correct to the nearest second, and for ascertaining the declination of the needle in these parts: and to prevent these observations from being committed to a separate Paper, I have thought it advisable to enter their results, together with the compleat series of levels, on the Chart itself. No observations for the Longitude of

[1] *Mad. Sel. XIX.* 1855. (25). [2] Note on Maps, MRO. (125) & MRIO. 137 (53). [3] MRC. ?–?–98.

any station have, as yet, been obtained; since neither the celestial phenomena, the weather, nor my more immediate avocations would admit of my taking any[1].

It is probably safe to say that Michael Topping was the most talented and highly qualified all-round surveyor that served the East India Company during the 18th century: and, from the ingenuity of his methods, the sound principles on which they were based, and the courage with which he urged them, he deserves a high place in the annals of the department [190]. It is a great disappointment that nothing has yet been found about his education or early life.

BĀRAMAHĀL & OTHER MADRAS SURVEYS, 1792–9

As we draw to the close of the century we find that the surveyors of the southern presidency were no longer confined to the traversing of roads but were given whole districts to survey, and, being now free to take full advantage of open hilly country and distant views, they were gradually feeling their way towards the system of a triangulation net.

The rapid sketch which Alexander Read made of the Salem and Bāramahāl districts, after their cession in 1792 [113], was a planetable sketch based on graphic triangulation, the first reported use of the *planetable* in our Indian surveys [263][2].

> For the want of other means, the bearings were taken with a plain table of 2 feet square, having a pin in the centre, a ruler as an index of 2 feet long, mounted with a vane at each end, to turn round the pin in observing; and a pocket compass, for setting it by the meridian: after which the paper for the draft was fixed to it, and the compass...removed.
>
> The distances were all computed in *gurries*, of about $1\frac{1}{2}$ miles.
>
> Every object and distance were carefully ascertained by careful enquiries of seldom less than 100 of the inhabitants.
>
> Every station being the highest, or most convenient. ... The drafts at each were severally made of different sheets of Royal Paper. ... The sheet to constitute any sketch being divided by a line to express the meridian. ... Adjusted by means of the compass and fixed to the table, and the pin being placed to express the actual station or common centre, bearings were first taken to every remarkable object and village, and the lines laid down to them at scale of 2 gurries to 1 inch. ...
>
> Roads also inserted and rivers. ...
>
> View from each station covered 20 or 30 miles square, and 25 in all were required, and the positions are described.

After an apology for the probable inaccuracy of his survey, Read justifies it on account of speed and cheapness;

> That it is erroneous is acknowledged, but it has cost the Hon. Company nothing, and contains the principle points of a map composed of the most accurate materials, which would cost thousands[3].

Beatson's rapid sketch of Palnād in 1787 [110], was

> the work of a few days.[4] ... The scale on which it is drawn is half an inch to a Geographical mile; this I deem sufficient for any general survey. If upon this scale the positions of principal places, villages, and remarkable peaks, hills,be accurately determined to serve as primary stations, the rivers, principal watercourses and large tanks are easily traced in by hand, as are arable, hilly or woody lands, and thus a picture of the country is formed on the basis of a map sufficiently minute for general purposes of revenue or military matters[5].

Allan's "Military Survey of the Baramahal and Ceded Countries", made in 1793 and 1794 [111], contained

> 2150 miles of principal Roads, with remarks on the adjacent country sufficiently minute for every military purpose, and views from nearly 100 different stations, from which about 4000 bearings have been taken with a Ramsden's Theodolite, most of them corrected by Azimuth's of the Sun[6].

[1] Report of 14-2-94, MPC. Feb. 1794. [2] though Sandes, I (46 n.) records that one was brought to Calcutta in 1742 by a young engineer. [3] Note on map, BM. Addl. MSS. 26102 (A). [4] elsewhere he says *three months* [110]. [5] MRC. 27-7-98. [6] MMC. 7-12-97.

Mather, employed by Read to make a more "particular survey of Baramahal district", made a careful survey based upon a number of points intersected by theodolite. His own description is somewhat confused; he seems to have intersected a number of prominent primary stations, from which he made further observations to fix topographical detail. The survey which appears to have covered the whole of the present Salem District took over four years[1] [113–4].

Montogomerie, in 1826, found it impossible to fit Mather's primary points to Lambton's triangulation, and reports,

This survey does not appear to be founded on Trigonometrical Triangulation, and although it is stated that the survey rests on a series of Bases taken on the plain south of Trichinopoly, (in what way any of them were measured is not specified) yet there is nothing to lead to the supposition that, in prosecuting the survey from these bases, that any other method was adopted than the mere taking of bearings (with what instrument not stated), and that the situation of places were determined by the mere protraction of the same[2] [114].

In 1799 Thomas Sydenham, who had succeeded to the command of the Guides [111], was sent up to survey the new southern boundary of Mysore, and started by measuring a base-line near "Ardenelle[3]" [pl. 9];

I found that a direct line of 3 miles could be conveniently measured, ...from which the surrounding hills could be accurately determined.

Some days were taken up in clearing the ground, in preparing the instruments for the measurement, and in tracing out the exact direction. ... The steel chain was carefully measured with a large brass sector, the thermometer being at 79½°, and its length found to be 50 feet 4 inches and 22/100; the next day the same process was repeated. ... The medium length...was adopted. ...

For the sake of convenience and to guard against the accumulation of trifling mistakes, the whole line was divided into three sections; ...each section was twice measured with equal care. ... I intended to have reduced these hypothenusal distances to direct ones by the usual methods of levelling. ...

As astronomical observations must however be considered the foundation of all geographical survey, I had provided myself with the instruments necessary to determine the longitudes and latitudes of the principal stations along the boundary; although the weather was in general so boisterous as to preclude the practicability of regular observations, yet, profiting by every fair interval, I had regulated my Chronometers sufficiently for the purpose of commencing. ...

The measured base-line afforded a sufficient data to have resolved a series of great triangles, by which a number of primary stations might have been correctly fixed. The latitudes and longitudes, which I intended to have determined, would have corrected the relative position of the primary stations, from which the adjacent country, and the exact situation of the boundary, might have been accurately laid down[4].

Unfortunately Sydenham went sick and was never able to complete his observations; it is possible that he might have found serious difficulty in adjusting the positions resolved from his base-line with those determined by astronomical observation.

MADRAS SURVEYING SCHOOL, 1796–1800

The following are the professional instructions drawn up by Goldingham in 1796 for Assistant Surveyors sent out to the districts from the Surveying School [114–5];

You will survey with as much accuracy as possible the — District; to facilitate the execution of this work, you will divide it into two parts. 1.—A General, 2.—A Particular[5],—Survey of the District.

To accomplish the first object, should the Country afford accessible Hills or other eminences conveniently situated, and commanding an extensive view, you will make these your principal stations; if the country be not of this nature, you must mark out principal stations by erecting tall signal poles of Bamboo with suitable flags on each.

From the top of one of these eminences, a signal being placed on another, you are to take the angles made by the first station (a flag being now placed on it) and the same objects, with any others not before in sight; if a third accessible eminence be near, you may repeat

[1] *Memoir*, DDn. 12. [2] DDn. 218 (74), 11–3–26. [3] Haradanhalli, 58 A/13. [4] DDn. 68 (21), 1799.
[5] The instructions for the *Particular* survey are quoted elsewhere [146].

the operation from it; among the objects observed you will include such as may be likely to afford other principal stations, also remarkable points of distant Hills, whether accessible or not, and in this manner you will ascertain the relative positions of all the principal points of the Country.

As early as possible in the survey, you will chuse a level and clear tract whereon to measure a Base line, so situated that you may have in view the greatest number of the principal stations, and at the most convenient angles; this line you will measure with a chain, the length of which must be accurately found by a standard brass Ruler at the commencement and finish of the measurement of each day; the length of the Base must be proportioned to the distance of the stations; and it would be measured with great care at least twice over, placing a stone at each end, whereby it may be found again if necessary; it should be levelled, and the measured line reduced to its equivalent horizontal distance. A second base of verification may be measured towards to conclusion of the survey if the country be extensive; the bearing of one end of the Base from the other you will determine by Astronomical observations. ...

The positions of all the stations in sight with respect to the base, you will ascertain by the requisite angles, take at each end of it.

Having thus established the principal points, you will readily ascertain the positions of all the villages...and objects not in view before, by short bases connected with points before determined, or by finding the point where two or more of the principal stations are in view, by the usual method, taking care to use the needle as little as possible. ...

You will determine the latitudes of some of the principal stations by meridional observations of stars on each side of the Zenith; observe eclipses of the satellites of Jupiter, for comparison with like observations taken at the Madras Observatory, and ascertain the difference of Longitude by a Timekeeper between the observatory and one of the principal stations or places in the District. ...

You will protract your work as you go on, and thereby discover if any mistake has occured in the operation of the day, that it may be rectified on the spot[1].

It is obvious that each of these district surveys would be completely independent of every other, and that its scale and the surveyed area in square miles would depend entirely upon the value taken for the measured base. Its geographical position would depend upon such astronomical observations as these young surveyors were able to make, or upon accidental connection with the work of other surveyors.

As a matter of fact, not foreseen by either Topping or Goldingham, nearly all these district surveys were eventually connected up by Lambton's triangulation, and became incorporated into the general maps of the Presidency.

We conclude with an extract from a pathetic little note from Thomas Turnbull, aged 15 years, from Devicottai [109],

The letter you have mentioned dated April 1st concerned of measuring a base, and to find our station by means of three objects, but here, Sir, is not a place—plain—extending to $\frac{1}{2}$ a mile in length; the District extends 7 by 5 English miles in *length* and *breadth*, and has only 32 villages. The 32 villages and principal Pagodas we have laid down in the accompanying protraction of our survey, but I can't think it to be of much accuracy without a base be measured. I have the Devicottah Pagoda and another Pagoda at Atchareram; to the top of these Pagodas we must mount up, according to Instructions of Captain Caldwell, but I have made a lascar go up, and he told us that we would not be able to go up ourselves, and...get the Instruments over—and neither we could not get the necessary things, which greatly hinders us from our survey[2].

JOURNALS AND FIELD BOOKS

The submission of regular journals has always been demanded from surveyors, partly as a voucher that they have employed their time to good purpose, and also to supply information about little-known country. The first orders given to Rennell were no exception;

You will keep a very particular Journal of your Proceedings, noting the Appearance and Produce of the Countries thro' which you pass; the name of every Village, & whatever else

[1] M. Rev. Bd. 22-12-96. [2] M. Rev. Bd. 13-9-98.

may seem remarkable, of which Journal you will give me a copy along with the Drafts you are to make of the Rivers and Creeks[1].

Rennell passed similar orders to his surveyors;

You are to keep a journal of your proceedings, & a book of remarks on the nature and situation of the several countries through which you pass[2].

Similar direction were given to Stevens & Pittman at Madras [92];

As a perfect knowledge of the Country may be of the greatest Consequence to the Hon'ble Company, You will endeavour to acquire all Such Information as may be of use to their officers or that can tend to forward the Service you are to be immediately employed on. For which Purpose you will keep an accurate Journal or Field Book, in which you will enter the Bearings and Distances of your Stations and of principal objects. Also the Properties of the Water and the Means of Procuring it; the Natures of the Soils, their Produce, with their effect on the Health of Animals, and the salubrity or unwholesomeness of the Air, accompanied by such Reports and Explanations as may render them perspicuous to the Hon'ble Board, and enable them to judge of their Fitness and Propriety. ...

You will be pleased to inform me of Your Progress once a month, or oftener should you judge it necessary[3].

In his orders to Burrow in 1787 [157], the Surveyor General directed that,

So long as your situation will admit I shall expect to receive from you monthly an account of your observations, and when this cannot be done, as often as you can find a favorable opportunity. ... I have also to request of you to keep a regular journal of your journey and observations, and your remarks respecting the Geography, History, of the different countrys of India through which you may have occasion to pass, will be a valuable addition[4].

Many of these journals are still preserved and make most interesting reading, more especially when the particular circumstances under which the surveyor was working are borne in mind.

In 1788, at the representation of the Surveyor General, Government issued orders for the regular survey of all routes marched by troops, with detailed instructions regarding the form of field book to be kept up [43].

The form was to be kept in four columns, the two outer ones for "Bearings and estimated distance of objects to the right and to the left"; the two central ones for "Bearings of the Road", and for "Distance by perambulator or Time" [188–9].

The names of all towns, forts, rivers and villages, when obtainable, are to be inserted in the two broad columns on each side, also all tanks, jheels, and ravines on the route of march, ground of encampment for one or more Corps, and occasional remarks as to the nature of the road and country.

Bearings of places and objects, with their estimated distances. ... The road distance, whether measured by a perambulator, or estimated by time. ...

An extraordinary allowance...for an Assistant Surveyor in the Field...to be drawn, ... upon producing from the Surveyor General a certificate of the Journal or Field Book having been kept with attention and accuracy.

The Field Books are in the first instance to be transmitted to the Quarter Master General, who will immediately...send them to the Surveyor General, who after taking a copy of them, is to return them to the Q.M.G., in whose office they are to be lodged[5].

Finding in 1794 that these instructions had produced but little information of value, the Surveyor General asked that the rules should be tightened, and

that an order be issued requiring all surveyors to transmit with their plans...fair and correct copies of their Journals or Field Books, containing all the original measurements by the wheel or chain, and every particular respecting their surveys in writing, and that no surveyor be considered...as having fulfilled the object of his mission...without transmitting...such Journal or Field Book[6].

He pointed out to Blunt, as one of the reasons for the submission of these copies, that,

As many surveys, however carefully performed, are liable to be suspected of considerable errors when applied to the purposes of Geography, if not accompanied by the original measurements of the wheel, bearings, astronomical observations etc., so I would advise you by all means to prepare a fair and correct copy of your journal and Field Book, to be given in with your plan after your return[7].

[1]From the Governor, 6–5–64, La Touche (9). [2]BPC. 5–12–76. [3]From CE., MMC. 22–3–73. [4]BMC. 23–6–87. [5]BGO. 29–9–88. [6]BPC. 5–12–94 (8). [7]DDn. 16 (60), 4–12–94.

To strengthen these orders still further, the Surveyor General proposed that surveyors' allowance should not be paid until copies of their field books were received;

All surveyors, acting in or out of the provinces, should transmit to the Surveyor General's Office Monthly Reports specifying the progress they have made in their surveys, and including regular transcripts of their journals or field books. The Surveyor General will notify to the Military Auditor General the arrival of all such reports at his office, until which information is received, the M.A.G. should not be authorized to pass their bills [1].

He explains as the reason for this order that

it has hitherto, in general, happened that gentlemen employed in this line have withheld their reports until their allowances have ceased, at which time it has been found that the ultimate result of their labours had been very inadequate to the time they had been kept on these duties.

These orders were duly published, and for many years to come they bore very heavily on surveyors working strenously and single-handed in the field; as is often the case, rules introduced to ensure regular procedure, and to protect Government against the idle or careless worker, proved vexatious to the honest hard worker. This was pointed out with much force by Thomas Wood, whose allowances had been held up because he had failed to send in regular monthly copies of his papers whilst out on survey, and disallowed for the period taken in making copies after return from the field. After describing the strenuous and successful nature of his field work for a period of over five months [58–9]. he continues,

Having mentioned these particulars to you, I am very confident you will not only be perfectly satisfied of the impossibility of my copying my Field Books, but likewise that without the most constant labour and perseverance, I could not have accomplished what I have...to detail. ...

Had I protracted and finished my work as I advanced, worked the various observations for Latitude &c., and sent you copies of the whole, I am inclined to think that for what I have got materials in five months, it would have at least occupied me two seasons. My not having spent my time doing so will, I therefore trust, not only meet with your full concurrence, but that...His Excellency the Commander-in-Chief...will be pleased to authorise a continuation of my allowances for such a time as he may think my exertions merit [2].

[1] DDn. 16 (133), 8-8-96. & MMC. 15–8–96 (12, 13). [2] BMC. 14–12–1807.

CHAPTER XIII

SURVEY INSTRUMENTS

Chains — Perambulators — Sextants & Quadrants — Compasses — Circumferentors — Theodolites — Chronometers — Supply of Instruments — Astrolabes — Instrument Makers.

SINCE for a proper understanding of the work of any surveyor it is essential to know what instruments he used, an attempt is here made to describe not only the names of the instruments used during the 18th Century, but their pattern, and the manner in which they differed from modern instruments.

There were, first, the instruments for measuring distance, Chains and Perambulators. Next, the instruments for measuring angles, Quadrants and Sextants; Compasses, Circumferentors and Theodolites. And thirdly, there were telescopes of special make for astronomical work, and chronometers and watches for transfer of time and longitude.

Many of these have already been referred to when describing the surveys, and there is no need to deal in detail with such essential articles as drawing instruments, protractors, brass scales, or levels.

Chains

Both Rennell and Barnard, and presumably therefore most contemporary surveyors, used chains, probably of much the same pattern as today.

Rennell twice records in 1764 that he measured his chain and found it from 6 to 8½ inches too long[1]; he does not say how this measurement was made, nor whether he corrected the length.

Chains were probably used for all large scale surveys, but seldom for military route surveys. There are many reference to the Gunter's chain, but only one specific reference to a 100 ft. chain. In an indent of 1787 the Surveyor General asked for *brass* chains.

In 1790 Burrow used "a 50 ft. steel chain", being "Ramsden's newly invented chain[2]", for the measurement of his degree of longitude, probably similar to those used by General Roy for his base on Romney Marsh, and by Lambton for all his base measurements[3]; with links of 2½ feet each.

Perambulators

These were used in preference to chains for most route surveys. The essential parts of the perambulator were the wheel which was driven along the ground, and a cyclometer geared to the wheel and graduated in miles and various lesser units. Perambulators were used by Rennell and were still being used 100 years later. In 1851 they are thus described;

The staple commodity for route Survey is the perambulator. All English perambulators are flimsy, bad in principle, and incapable of working except on a smooth road or bowling green; across country they go to pieces in a mile or two. There is nothing like the Madras pattern

[1] La Touche (125). [2] Dalby. [3] Now preserved in GBO. museum, Dehra Dūn.

principle of the endless screw and differential plates. The large Madras perambulator [invented by John Pringle] has two faults, the wheel is not sufficiently strong, and it is graduated to furlongs and yards[1].

The Madras Pattern 8 mile Perambulator...consists of a wheel 20 feet in circumference, driven by two handles passing through the axis of the wheel: this axis is geared to dial plates which give readings of miles, furlongs, yards, feet, and inches. To a surveyor it is of little use [but cf. Pearse *inf.*] its great height (nearly seven feet) rendering it difficult to manage in a high wind, and requiring two men to work it. The only advantage it has over other instruments of the kind is that it bears its own weight and, the handles being about the height of a man's chest, it is only necessary to keep the wheel steady, when the least pressure sets it in motion[2].

There were various patterns of Pringle's perambulator. Allan used one of 5 ft. 1½ inches diameter, "41 times of the wheel in a furlong[3]", whilst Colebrooke used "a wheel of 7 feet diameter, with Rackwork, divided into furlongs and 30th parts[4]".

Surveys were constantly interrupted through the breakdown of the perambulator; Rennell says that he could not get the exact situation of Cuttack because Campbell's "perambulator was spoiled between Cuttack and Balasore[5]", and Pearse tells of trouble he had with perambulators on his marches to and from Madras;

In the march to the Carnatic it was found that the perambulator was rendered useless before the detachment had performed a fourth of the march; the Surveyor was actually obliged to buy a new one at Masulipatam, and that also became useless before we reached Madras [41]. The perambulators with small wheels and clockwork are therefore, by experiment, proved to be unfit for service of any duration.

In the Madras Army Captain Pringle measured with a wheel of 7 feet diameter [97]; and I caused a wheel to be made of the same dimensions, and adapted to it brass counting machinery, very different from what he had used, and I think better. One of these was used in my journey (with the cash) from Ganjam to Madras [155 n. 7], and afterwards in all our subsequent marches quite down to Cuddalore, and from thence to Calcutta. Before we set out upon our return, two more of the same kind were constructed, and connected together by an iron axle-tree; and with these three the distances were measured for that fine survey which was made by Lieutenant Colebrooke. ... I therefore recommend the single wheels of this construction for all future surveys, and will lend mine to the arsenal as a pattern for more to be made by. As perambulators are included in the proportion of stores, I beg leave to recommend sending them to the different stations, and also one to the office of the Chief Engineer, and another to that of the Surveyor General[6].

As regards price, the Surveyor General purchased one from an officer in 1787 for Rs. 130; and in 1795 Mackenzie paid about 12 Pagodas for one of large pattern.

In 1797 Goldingham obtained sanction "to make up some Surveying Wheels" upon a design of his own, for use at the Surveying School.

SEXTANTS & QUADRANTS

Reflecting instruments on the familiar principle of the Sextant had been used by navigators from the latter end of the 17th century. In 1731 John Hadley published an account of his new reflecting Octant, which was a great improvement on any existing instrument of the sort. It was provided with a tangent screw, telescope, and vernier scale, enabling the navigator to determine his latitude with accuracy, and was equally well adapted for coast surveying by triangulation. In 1733 he added a spirit level.

As time went on it was found desirable to use a more extended arc, and the Sextant was introduced in 1757, and Quadrants about the same time; the arc was later enlarged to 120 degrees, and some patterns took the form of Reflecting Circles. With these reflecting circles observations could be repeated and the mean taken, centring and other errors being thus eliminated[7].

[1] Thuillier & Symth (360–1). [2] ib (107–8). [3] Note in fdbk., MRIO. M. 77. [4] Note on chart, MRIO. 138 (41). [5] *Memoir*, 1783 (68). [6] To GG.; *Ben P. & P.* VII (120). [7] *South Kensington* (5).

When Rennell was preparing for his voyage to the East Indies as a midshipman, in 1760, he wrote to his guardian;

I believe I shall want a Quadrant and a book call'd the East India Pilot [169 n.2]. ... They'll cost about £ 3–10–0, it must be one of Hadley's Quadrants. ... I have furnished myself with drawing compasses, Navigation Books, &c.[1];

and this was the quadrant he used on his first survey in Bengal.

On his journey to Poona Smith used

an astronomical Quadrant...made of brass, of 20 inch radius; turns horizontally upon a pointed steel axis about 2 ft. long, ... with spirit and plumb line; but as we seldom staid more than one night in a place, the observations were necessarily made in the open air, and generally in a brisk wind which rendered the plumb line useless, and the observations themselves sometimes rather uncertain to half a minute or more[2] [162, 175].

Pearse gives the following account of his instruments;

I had only a tolerably good quadrant and quicksilver till December 1776, when I was lucky enough to get an 18 inch land quadrant, made by Ramsden, with a micrometer to subdivide the nonius. This inverts, and is capable of the nicest adjustments. ... In August 1777, I obtained Mr. Smith's refractor, made by Dollond, with a triple object glass, and a double object glass micrometer. ...

Going to Madras in 1782 [155 n. 7] I used an Hadley's octant and quicksilver [to which he made elaborate modifications so that] by this contrivance, with an octant, I could take angles of 150°: and consequently meridian altitudes as far as 75°. ... In the way back, we had a land quadrant of 15 inches radius, ... sent out by the *India Company*. It was used by Mr. Hurst, in the transit of *Venus* [153]. This could not be inverted, but, to destroy the effects of collimation and error of level, the latitudes are all determined by stars taken north and south of each place, as the observations will shew [154][3].

For his more important work Topping mounted his "Hadley" on a stand [172], but though the Surveyor General in Bengal indented for quadrants thus mounted, the Directors replied,

All the instruments desired for the use of the Surveyor General's office...will be sent this season, except the two land Quadrants with stands, which must be deferred for further explanation; the Astronomical Quadrant is sent as desired, which it is supposed must answer every purpose for which the others can possible be required [205][4].

In 1789 the Directors

ordered to be sent on one of the Ships of this season an Astronomical Quadrant made by Bird[5], which we purchased for the use of Mr. Topping in his survey of the Coast of Coromandel.

COMPASSES

The compasses of the 18th century appear to belongs to three main types.

The Pocket Compass, reading to 8 or 16 points, was probably carried by most officers and surveyors, and must very often have been the route surveyor's only instrument besides his perambulator.

The Azimuth Compass was a superior instrument altogether. It consisted of a floating needle, and a ring graduated to degrees which revolved with a pair of open sights, the line of sight coinciding with the zero of the ring. This compass varied from three to five inches in diameter, and was used from a stand[6].

Thirdly, the Compass that was incorporated into the Theodolite, also graduated to degrees.

All readings had to be taken by the naked eye.

We have found very few direct references to the compasses actually used; Rennell makes no mention of his, except that he observed the variation of his needle, bnt it was probably a pocket compass that Ferguson reported for misbehaviour under musketry fire [28].

Lennon, when surveying in 1783, had no other instruments with him than an azimuth compass and a perambulator; Colebrooke in 1786 took his bearings "with

[1] HMS. 765, 2–2–60 [2] BM. Addl. MSS. 29213. [3] *As R.* I (58–61). [4] CD to B. 8–4–89 (118).
[5] Probably successor to John Bird (1709–56), *DNB*. [6] *South Kensington.*

an Azimuth Compass and another of smaller dimensions", but in 1788 Burrow regrets that though he had "a theodolite and a small pocket compass" of his own, he had no azimuth compass [204].

All experienced surveyors, from Rennell onwards, took regular astronomical observations to determine "the variation of the needle", that is, the declination of its scale zero from true north. This would of course be of no value with a pocket compass, but would be important for bearings taken by theodolite, which could give readings by vernier from the magnetic meridian, sometimes to one minute.

Some compass rings were graduated counter-clockwise from 0° to 360°; others were graduated from 0° to 90° for each quadrant independently; in recording from the latter a note had to be made as to the quadrant [189].

CIRCUMFERENTORS

Goldingham mentions the use of a circumferentor on his survey of the coast in 1793 [192] when the traverse between major signals was run by circumferentor and perambulator. A circumferentor was also included amongst the instruments issued to each assistant revenue surveyor sent out on district surveys [206].

The circumferentor was a compass on a stand, with a small spirit-level for setting it horizontal. It had a 9-inch circle, graduated in degrees and reading by vernier to 3 minutes. Fixed to the circle was an alidade with sights at either end [1].

THEODOLITES

Bion describes the English theodolite of the early 18th century as consisting of a brass horizontal circle, reading sometimes to 2 minutes, but without a vernier. The rotating telescope could be elevated and depressed, but had no vertical circle. During the 18th century improvements were added which included a vernier reading to a minute; a compass whereby all angles and bearings were referred to the magnetic meridian; and a vertical arc. In an article published in 1822, Edward Troughton, the great instrument maker, writes

> that the early theodolite had a single very poor azimuth circle, and angles were observed from the magnetic needle. It was really a telescopic compass[2].

An early Altazimuth Theodolite is thus described in the catalogue of the Science Museum;

> The Alidade carries a vertical arc, and also a telescope with vernier arm; ... 8-inch horizontal circle graduated in degrees, and read to 5 minutes by a vernier scale on the alidade. The vertical arc has radius of three inches, and is graduated to degrees up to 50 degrees on each side of the zero, and read to 5 minutes by vernier. A 4-inch compass fixed to the alidade is graduated to degrees. Telescope of 10-inch focal length, and $\frac{1}{2}$-inch aperture. Spirit levels for levelling. Two parallel plates for fixing the instrument to its tripod are connected by four levelling screws and spherical joint[3].

Rennell did not receive a theodolite until 1767; Barnard used a theodolite[4] from that year for his survey of the *Jāgīr*.

On Kelly's survey of Fullarton's marches angles were taken "with a complete theodolite [185]", and during the Third Mysore War Colebrooke used

> a fine theodolite by Ramsden with telescopes and spirit levels, and a smaller one by Cole with sights and Nonius. The latter was used most frequently on account of the case and readiness with which it might be put up[5].

In 1795 Mackenzie indented for a

> good Theodolite, ... if possible, ... with the latest improvements, the horizontal plates and vertical arch moved by screws, and with a good telescope fixed, and spirit levels[6].

[1] Bion; & *South Kensington* [67–8]. [2] *Memoirs RAS.* I, 1822 (54). [3] *South Kensington* (70).
[4] Midnapore *Dist. R.* (168), 5–467. [5] Note on chart, MRIO. 108 (41). [6] MMC. 10–1–95.

Reference must be made to two instruments of a different class;

"An Equal Altitude Instrument, made by Troughton, which cost 50 guineas in London", used by Emmitt for determining the variation of his compass[1] [178].

An instrument purchased by the Surveyor General in 1795 for astronomical observations at Calcutta [167];

It is a large circular instrument upon a new construction, called the New Improved Equatorial, ... made upon the same plan as the instrument used by General Roy to ascertain the difference of meridians between Greenwich and Paris. ... Mr. Timbrel the proprietor bought it in London for 167 Guineas; and carried it first to China, where not having met with a purchaser, he wishes for a moderate profit to dispose of it here. The price fixed is two thousand sicca Rupees[2].

The purchase was sanctioned, and he writes to Topping,

I have procured a new improved Equatorial Instrument of two feet diameter, but the stand having been left in England or China by mistake, I have not yet been able to make any use of this Instrument, which I hope however to do in time, having written to Chunarghur for a block of stone, which, if properly cut, will answer as well, if not better, than the stand originally intended for it[3].

CHRONOMETERS

The possibility of determining Longitude at Sea by the use of a Time-keeper was first pointed out by the Flemish astronomer Gemma Frisius in a work on navigation published at Antwerp in 1530. ... During 1729–60 John Harrison, a Yorkshire carpenter, invented and constructed four practical marine time-keepers, with the fourth of which he won the reward of £ 10,000 offered by the British Government [151]. ... Harrison's mechanism...was complicated, delicate, and costly, ... accordingly it had little direct effect on the evolution of the modern chronometer. But in 1765 Pierre le Roy of Paris invented and constructed a marine time-keeper, whose mechanism embodied...practically all the essential features of the modern chronometer. Le Roy's work was followed up by Berthoud in France and by Arnold and Earnshaw in England.

The last named produced, as early as 1785, several chronometers, which, both in appearance and mechanism, are scarcely distinguishable from the machine of today[4].

The earliest reference we find to a chronometer being used in India is a note by Dalrymple of one owned by Forrest [46], which

fell into very good hands, for it was purchased by Lieut. J. S. Ewart, who made very good use of it during two years in Bengal and the interiour part of India [155]; and then, as he informs me, spared it to one of the vessels gone to the North West coast of America, from which therefore Geography has much to expect[5].

Both Burrow and Topping made regular use of chronometers and watches. For his longitude observations in 1787 Burrow bought an Arnold's chronometer and a large timepiece for Rs. 1,700 [158], and writes,

The Chronometers of Mr. Arnold are certainly one of the greatest additions that were ever made to Geography, but the dampness of the weather of India in the rainy season is so excessive as to occasion irregularities in their rates that may lessen their utility considerably, if not guarded against. ...

After taking them both out of their cases, and wrapping them carefully in cotton, and covering them well from the damp air, in a close box, they then went very well & were of uncommon service[6].

We have already noticed that, between his principal longitude stations, Burrow interpolated others by means of several watches whose rates he constantly checked [162]; that he forgot to wind the watches and had to stay an extra week at Dacca to re-observe their rates [158]. and that on his return to Calcutta he found all the watches had altered their rates very considerably [159, 162]. In measuring his degree of longitude he made use of nine watches [166].

On his journey by land from Masulipatam to Calcutta in 1786 [171], Topping had a small chronometer

by Arnold, that had before been under trial on a voyage from England to the Coast, and afterwards at Madras during an interval of twelve months. The account which follows of the

[1] Bo. S & Pol. 23–11–92. [2] DDn. 16 (69), 15–1–95. [3] DDn. 16 (98), 13–11–95. [4] *Ency. Brit. sv.* Chronometer. [5] Forrest, (Preface). [6] IO. Maps MS. 5.

method observed to ascertain its rate on the road, will show how satisfactorily it performed on this occasion: ... the chronometer appears to have been very little affected, by the motion of the Palanquin, between the last two stations[1].

At the end of 1792 he asked leave to make a voyage in order to test some chronometers just received from England [173][2];

These watches are now in good order, and should be used before they have been too long out of the maker's hands, after which they are found to be much less valuable than at first for settling the Longitudes of places.

Huddart fixed the longitude of many places down the west coast by carrying chronometers from Bombay, and comparing their times against that from astronomical observations [176].

Chronometers were sometimes contrary and Sydenham reports that though he had carefully recorded the rate of his watch, by Arnold, from "a series of comparisons at the Madras Observatory", yet on

30th March...the watch stopped without any visible cause, having been carefully wound up the preceding day, and every precaution used to secure it against accident. This unpleasant circumstance rendered it necessary to ascertain a new rate[3].

In 1786 the Directors sent out for the Bombay Marine survey [124] "one Box and two Pocket chronometers", ...and directed that

in case of any accident unfortunately happening to the Box Chronometer, it must not be put into the hands of any Artist in India, but returned to us. We are informed that the Pocket Chronometer can be repaired at Calcutta[4].

It is sad to find, however, that two years later McCluer reports,

The Chronometers sent out by the Company are all useless; the large one was sent to Governor Boddam, that it might be taken to Europe. The small ones are both rendered useless, one is with me, and the other is lodged in the Secretary's office. The Longd. has been accurately measured by a very good one, sent me by Mr. Dalrymple[5].

SUPPLY OF INSTRUMENTS

In the early days it was not the Company's policy to supply its officers with surveying instruments; they were expected to provide their own, even though no provision was made for this in calculating their allowances [205, 277]. A small stock however, of the more common instruments gradually came to be kept amongst the engineer and military stores, and could sometimes be obtained from the arsenals on payment. As the Company's servants were the only traders allowed in the country, there were no merchants or shopkeepers to import such articles; officers who wanted instruments had therefore to purchase them from England, though after a time they were sometimes brought out amongst the goods which every captain of an Indiaman had the right to bring out as his private speculation [90]. When an officer died or left the country, any surveying instruments among his property were sure to find purchasers, and sanction was often obtained to purchase them for Government stores.

In 1775, Ross, Chief Engineer, Madras, wrote to Stevens, who must have possessed some instruments already, but apparently had asked for others,

I will send you the Astronomical Quadrant with a great deal of pleasure: I am sorry that I have not a Theodolite that will answer your purpose, but you may depend on having the best of the season. I have wrote for several, but am afraid they won't be out this year.

The Company have never sent me any Instruments, tho' it was one of the first things I did to indent for them. What I have hitherto got were such as the officers of the ships brought out for sale, which will account for their being of inferior quality[6].

Again, to Government, on the close of Johnston's survey in Vizagapatam [93],

Mr. Johnstone should be directed to bring with him all the Surveying Instruments that are not immediately wanted by Mr. Maxtone. Among which are those belonging to the Estate of the late Captain Pittman; they have been in use for the Company ever since his death, and, as they are still wanted, should be purchased[7].

[1] *Oriental Repertory*, I (419 *et seq*). [2] 4 pocket chronometers advised; CD to M. 16–5–92 (15).
[3] Journal, MRIO. M. 83. [4] CD to Bo. 8–3–86 (29). [5] Bo PC. 18–9–88. [6] Mack. MSS. LXVIII, 18–6–75.
[7] MMC. 6–1–77.

Again, in 1782,

The great want of mathematical and surveying instruments for the service of the Engineer's Department induces me to request that your Lordship will allow me to purchase ...several useful articles brought from Europe in the ships of this season, amounting to about 400 Pagodas [1].

Mathematical instruments were a favourite form of official present. When Bogle went on his mission to Tibet, he took with him as presents to be distributed in Bhutān [2],

A Case of Mathematical Instruments valued at	...	...	Rs. 40
Barometer, Thermometer, Hydrometer	,,	...	100
Three Thermometers	,,	...	60
Four Compasses	,,	...	56
A Quadrant	,,	...	18
A Microscope	,,	...	30
A small Telescope	,,	...	36
Two Spying Glasses	,,	...	20
Three Prisms	,,	...	24
An Electrifying Machine	,,	...	200

In 1771, the Directors send out as a present for the Nawāb of the Carnatic an Instrument of curious design and workmanship, called an Orrery, which exhibits the revolutions of the Planets [3].

and twenty years later presents for the young Peshwa included "an Orrery, Globes, Maps, and Philosophical Instruments" [4]: the orrery was damaged on the journey, but Emmitt was able to repair it.

When Burrow was ordered on his astronomical survey in 1787, he had the greatest difficulty in collecting suitable instruments, but, not being a convenanted servant, was able to get Government to pay for those which he managed to find [158];

With respect to the Instruments, Calcutta is not a place where it is easy to be furnished, even with bad ones, from the shops; I had brought some good ones from England, but had the misfortune to have them stolen, & there was none belonging to the Company in the Settlement, so that I was obliged to borrow where I could; & am particularly obliged to Lt. Wm. Golding of the Bengal Engineers, for use of a 4 foot refracting telescope; & to Captain Justinian Nutt [5] for the lend of one of Mr. Arnold's timepieces for several months during his stay at Calcutta; Mr. E. E. Pote also favoured me with the use of an excellent Telescope made by Ramsden, & Captain Garstin, with one of Ramsden's theodolites.

I had likewise a sextant made by Troughton of 6 inches radius, & two of Mr. Arnold's Chronometers; one of them was very old and without any of his last improvements, but the other went very well; and I had also a Barometer and Thermometer; and an Astronomical Quadrant made by Captain Ritchie, but this last was so liable to error of all kinds (being for the most part made of wood & excessively ill contrived) as to be in a manner almost totally useless, and rather burthensome than serviceable.

For his trip to Cheduba the following spring,

The instruments I took with me were two watches made by Arnold belonging to the Company, & a Sextant & Telescopes; a theodolite & a small pocket compass of my own. I had neither Azimuth compass, nor log-line, nor time to procure such things, when I received orders to go on board, nor could I with propriety expect such things from the ship as they were continually wanting them for their own observations [6].

In 1787 the Surveyor General asked Government to sanction the purchase of a number of instruments, the property of an officer of Engineers who was going home, as there is not a single instrument in the Office belonging to the Company, and were they to be commissioned from England there would not only be a delay of several years, but very little difference in the expence.

These instruments consisted of

	Rs.
A large and complete Magazine case of Mathematical Instruments, containing 6 Parallel Rulers. ... etc., etc.	300
A very complete pentagraph by Ramsden	150
Spirit Level by Ramsden, with long telescope, compass, etc.	200
Perambulator	130
A sextant with telescope	250
A large Theodolite, with long telescope and spirit level	280 [7]

He replied to the Government's query as to how the Surveyor General's Office had hitherto been supplied with instruments,

[1] Mack. MSS. LXVIII, 8–4–82. [2] HMS. 219 (347), 3–5–74. [3] CD to "Nabob of Carnatic", 10–4–71. [4] HMS. 615 (286). [5] Captain of an Indiaman. [6] Journal, IO. Maps. MS. 5. [7] MMC. 27–9–87.

Some years ago...our plans were contracted for to be completed for a specified sum of money, and there is no doubt the Expence for Instruments as well as every other must have been considered [235]. At present I have a salary of 500 Sonat Rupees a month for myself, and 600 for Draftsmen, but no allowance for instruments [203, 277], which of course ought to be furnished by the Hon'ble Company. ...

I further beg leave to recommend...that the Court of Directors be requested to send out every two years for the use of my office the...Instruments which are included in the accompanying list, which I have now the honour to send you, and if possible to be made by Ramsden.

This indent included drawing instruments of all sorts and

A Spirit Level.
Two Land Quadrants with stands.
An Astronomical Quadrant.
Two small Theodolites, strongly made, with double Telescope and a spare long telescope for each.
A Pentagraph.
An Improved Perambulator.
Two hanging, and two pocket, compasses.
Two hundred-feet Brass Chains with arrows.
Two Gunter's Brass Chains with arrows [1].

Government sanctioned the purchase of the instruments on sale and forwarded the indent to England, which in due course was supplied with the exception of the land quadrants [200].

About this time Reynolds in Bombay succeeded in replenishing his stock of instruments at Government expence:

Among the Investment of the *Imperial* ship, lately arrived, are a variety of mathematical and Astronomical Instruments suited to the service on which I am at present employed, and as such an opportunity is not to be missed of providing myself with these Instruments, ... I beg leave to solicit your permission to Purchase them on the Honorable Company's account.

Accompanying is a list with their prices sent me by the Captain of the Ship. I must do him the justice to say that the prices are very moderate, and much below what such articles generally sell for in India.

The Military Storekeeper was directed to purchase what Reynolds asked for [2].

In 1788 the issue of a perambulator and compass from Government stores was authorised for any survey of a military route, on the indent of the commanding officer [196] [3].

In 1792 the situation as regards instruments at Madras was so difficult that the Chief Engineer wrote to Mackenzie, on his being posted as surveyor with the Nizām's Subsidiary force,

An Artificial Horizon is not to be got. Topping endeavoured to render that which Lennon had serviceable for you, but it did not succeed, you must therefore make the most of some quicksilver in a saucer, and chuse still weather for your observations. The Major [Maule] and Sergeant Balfour have been trying at a wheel for you; their Progress I cannot exactly ascertain, but believe it rather slow [4].

The following year Topping submitted a second indent for mathematical instruments,

which I hope will be complied with, as there are no Instruments fit for the surveying service of any value belonging to the Company in the Country [5].

In 1795, Mackenzie sent in from Hyderābād an account of the instruments that had been provided to him in 1792, and an indent for replacement and addition;

—provided by himself,

Brass Sextant by Ramsden, with Astronomical Ephemeris Tables.
Theodolite, with stand, complete.
Brass Chain of 50 feet.
Large Perambulator.
Achromatic Telescope, 4 feet.
Two Pocket Compasses etc.

—provided from the Chief Engineer's Office,

Brass Circular Protractor
Large Parallel Ruler
Box of Colours
Tracing Glass, with some stationery.

—and now required,

A Good Theodolite,
Artificial Horizon, with ground glass plates; very much wanted.
Small jar of Quicksilver.
Azimuth Compasses.
Achromatic Telescope.
Tracing Glass.
Two cases Mathematical Drawing Instruments; the common brass kind are not fit for any work of accuracy; they should be chosen of the best kind. ...
A pair of Thermometers and Barometers.
A Pocket, or Portable, Compass.

[1] MMC. 27-9-87. [2] Bo. S & Po. 5-2-88. [3] BGO. 29-9-88. [4] Mack. MSS. LXIX, 1-8-92.
[5] MPC. 19-4-93.

The above list, if supplied will render any application for instruments unnecessary for some time. If any of the kind wanted are among the stores at Masulipatam, they might be ordered to be supplied on indent from thence[1].

The following instruments were supplied to each pair of Assistant Surveyors sent out from the Surveying School on district surveys[2];

Theodolite,
Levelling Instrument.
Telescope for celestial observations.
Small Telescope.
Hadley's Sextant.
Artificial Horizon.
Thermometer.
Circumferentor.
Chain.
Two Teak measuring rods.
Brass standard measuring rod.
Perambulator.
Protractor.
Case of Drawing Instruments.

ASTROLABE[3]

Some description must be given of the Astrolabe, the oldest scientific instrument in the world, which we have already noticed as having been used by the early astronomers and travellers [148, 151], and, as late as the 18th century, by the missionary Tieffenthaler [150].

In its simplest form it consisted of a circle or disc of metal or wood, suspended by the edge from a ring, and fitted with an alidade which rotated to give readings from a scale of degrees. With this instrument, the elevation of sun or stars could be observed for the deduction of time and latitude [176].

INSTRUMENT MAKERS

It is not surprising to find surveyors of the 18th century complaining of the quality of the instruments they had to work with, and the following extract is taken from a letter written by Pearse to an uncle in England.

Adams' Thermometers are too short for India. I have seen the mercury 120. ...

I never had any opinion of Adams; when I was in Europe I had seen some of his instruments very defective, ... his being King's Mathematical Instrument Maker makes him careless; but I have seen many instruments of Ramsden's in India exquisitely good.

I have an astronomical Quadrant of his make which is extremely fine [200]; and I have seen refractors of his, little, if anything, inferior to Dolland's; so that I have a very high opinion of him[4].

[1] MMC. 10–1–95. [2] M. Rev. Bd. 22–12–96. [3] *Ency. Brit.* [4] Letter of 3–4–78. *Mil. Repository*, I (155).

L'EMPIRE du GRAND MOGOL

by Sanson d'Abbeville, 1652.



Plate 11

Reduced by one-tenth from map in the British Museum, K. 115 (25) by permission of the Trustees.

A great advance on Mercator's map, Plate 3, but interior detail pushed too far north, compare Plate 1.

Note, in contrast, the comparative accuracy in latitude of the coastal detail, both here and in Plate 12.

PRESQU' ISLE de L'INDE
by Sanson d'Abbeville, 1652.



Reduced by one-tenth from map in the British Museum, K.115(60) by permission of the Trustees.

Note how the Western Ghāts, which are visible from the coast, have been pushed far into the interior, Malabar and Canara being allowed far too much room. Compare Plates 1 and 3 [illegible] coming as that of Plate 11.

Plate 12

Published at S.I.O. Dehra Dūn.

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CHAPTER XIV

MAPS OF INDIA

Ancient Geography[1] — *Early Maps to 1750* — *D'Anville's Map of 1752* — *Jefferys & Orme* — *Rennell's Map of Hindoostan, 1782–93* — *Thomas Call's Atlas, 1782–9* — *Reynolds' Map 1793–1807* — *Colebrooke & others.*

THE first ideas to reach Europe about the geography of India came through Alexander's invasion of B.C. 330;

> The actual campaigns...were confined to the valley of the Indus and its tributaries; but the information collected...included the whole valley of the Ganges on the north, the eastern and western coasts of the peninsula, and some scattered notices of the interior of the country[2].

This information was worked into shape by the Greek geographers Megasthenes and Eratosthenes[3], the latter attempting the first map of India. He held that the earth was spherical in shape and the centre of the universe, and, making astronomical observations and calculations for the length of the earth's circumference, laid the first foundations of scientific geography; his ideas of the dimensions and form of India are said to have been a better approximation than those of most of his successors up till about the 17th century[4], "but he strangely distorted its outlines, so much so that India extended from West to East, with Cape Comorin as its most easterly point[5]", whilst the ocean beyond formed the limit of his world.

He was followed by Ptolemy[6] [220], mathematician, astronomer, and geographer of the 2nd century A.D., who established the geometrical principles of geography, and insisted that astronomical observation was the only scientific basis for a map [148]. He constructed a map of the world and separate maps of other countries, collecting information from historians and travellers. Unfortunately he took the value of the equatorial degree as 50 instead of 60 geographical miles, and having but few observations for latitude, and none for longitude, his positions were mostly estimated by mutual bearings and distances, and thus vitiated by his error. His Indian peninsula is typical of the distortion produced, being compressed in latitude between parallels 11° and 20°, but stretched in longitude from meridians 110° to 150°. Ceylon on the other hand is swollen to 15° north to south, and 12° from east to west.

Ptolemy shows the Himālayan range [67], with the Ganges flowing south-east from the mountains to the sea. He is the first to apply the term *India intra Gangem* to the region west of the Ganges, and that of *India extra Gangem* to that to the east, whilst beyond that again he shows the *Chersonesus Aurea* and *Sinæ*[7].

Both D'Anville and Rennell refer repeatedly to his map, Rennell remarking,

> Although this geographer's map of India is so exceedingly faulty in the general form of the whole tract; yet several parts of it are descriptive. ... Ptolemy's ideas were collected from the people who sailed along the coast. ... A work which has travelled down to us from the second century...must have possessed something worthy to recommend it[8].

Wilford writes, probably before 1800,

> It is my opinion that, in the times of Pliny and Ptolemy, they had a more full and copious geographical account of India than we had forty years ago. Unluckily through the want of regular itineraries and astronomical observations, their longitudes and latitudes were only inferred; and this alone was sufficient to throw the whole of their geographical information into a shapeless and inextricable mass of confusion[9].

[1] For a general account of the early geography of India, *v.* Murray, I. [2] Sastri (lxiii). [3] c. 276–196 B.C., in charge library, Alexandria, Sastri (xxiii). [4] Bunbury, I (635). [5] Noti (142). [6] Claudius Ptolemaus, who wrote about 150 A.D.; *Ency Brit.* [7] Map, *Oriens Secundum Ptolemæum*, faces p. 481 Murray, I, and coast-line of India inset on frontispiece of *Antiquité Géographique*. [8] *Memoir*, 1793 (241). [9] *As R.* XIV, 1822 (374 n).

One substantial contribution made by Ptolemy was a table of places with latitudes and longitudes, the former from the parallel of Rhodes, and the latter calculated from Ferro [242 n. 2]. A Latin translation of his *Geographia* appeared in 1462, and his maps were redrawn and printed in 1472.

The next great contributors to Indian geography to be noticed are the Chinese pilgrims Fa Hian and Hiuen Tsiang, who visited the sacred places of India A.D. 400–13 and 629–45, leaving valuable accounts of their journeys.

From the 9th to the 13th centuries a succession of Arab travellers and geographers left careful records of the places they visited and described, fixing positions by means of estimated distances. They illustrated their writings by diagrams rather than maps, and one of these, by Ibn Haukal, is shown on plate 4 [220].

The following is an extract from an Arab work completed in 1310, which is more precise when dealing with internal detail;

Hind is surrounded on the east by Chin and Machin, on the west by Sind and Kabul, and on the south by the sea. On the North lie Kashmir, the country of the Turks, and the mountain of Meru [1], which is extremely high, and stands opposite to the southern pole [2].

Though containing little in the way of maps, old Hindu Sanskrit writings contain much accurate geographical information, of which it has been said that,

Although there is plenty of the fabulous in Indian geography of outlandish regions, the allusions to purely Indian topography are generally sober. The main features of the country were adequately known in very early times [3].

Wilford, who was the first serious student of such Hindu literature, writes,

Besides geographical tracts, the *Hindus* have also maps of the world, both according to the system of the Pauranics, and of the astronomers; the latter are very common. They have also maps of India, and of particular districts, in which latitudes and longitudes are entirely out of question, and they never make use of a scale of equal parts. The sea-shores, rivers, and ranges of mountains, are represented in general by strait lines [cf. pl. 4].

The best map of this sort I ever saw, was one of the kingdom of *Napal*, presented to Mr Hastings. It was about four feet long, and two and a half broad, of paste board, and the mountains raised about an inch above the surface, with trees painted all round. The roads were represented by a red line, and the rivers with a blue one. The various ranges were very distinct, with the narrow passes through them; in short, it wanted nothing but a scale. The valley of *Napal* was accurately delineated; but towards the borders of the map, everything was crowded, and in confusion. ...

These works, whether historical or geographical, are most extravagant compositions, in which little regard is paid to truth. ... Geographical truth is sacrificed to a symmetrical arrangement of countries, mountains, lakes, and rivers, with which they are highly delighted [4].

Though in later life Rennell showed an interest in ancient, or comparative, geography, he remarks of his *Memoir*, "I have generally avoided all disquisitions of this kind, from a conviction of the general obscurity of the subject [5]".

EARLY MAPS TO 1750

The invention of printing was a great stimulus to the study of geography, and between 1472 and 1480 seven editions of Ptolemy's maps were issued. During the following century a number of Italian and Dutch maps appeared which discarded Ptolemy's information, and gave to India new and sometimes strange forms from the tales of later travellers.

Plates 2 and 16 show Italian maps of the 16th Century by Bertoli and Gastaldi [6]; but later maps by Giacomo Cantelli da Vignola, published at Rome in 1683, show a considerable advance in knowledge [7].

There are a number of Dutch maps, the earlier ones being wildly imaginative, with picturesque ornamentation in the way of ships and sea monsters; even the names of their geographers have an air of romance; Hadriano Relando; Gerard

[1] Mythical mountain of Hindu geography. [2] Elliot, I (42); (ch. I entitled *Early Arab Geographers*). [3] Sastri (xxxix). [4] *As R.* VIII, 1805 (270–1). An example of such a map appears as frontispiece to Gladwin's *Ayeen Akbery* [133 n. 3]. [5] *Memoir*, 1788 (10). [6] Giacopo di Gastaldi, "the greatest of the Venetian mapmakers of 16th century". [7] Imp. Lib., uncatalogued.

Mercator; Johann Huydekoper; de Witt; Pieter Goos; Hendrick Doncker; Hugo Allarot; and Nicolaum Visscher. Plate 3 gives a fine map from Mercator's atlas of the early 17th century.

Plate 10 shows a map of the late 16th century, a tiny map drawn by Father Monserrate after his visit to Akbar's court, 1579–82 [11], which commands our respect as the first map even partly based upon measured routes and astronomical observation, the surveyed line running from Surat through Delhi to Kābul.

The chief merit of the map is the delineation of the western Himālaya and the upper courses of the rivers from the Jumna to the Indus, which are better shown than in any other map for the next two hundred years [68], though it is seriously out in longitude. It was never printed until 1914.

The first English map of any value was drawn by William Baffin in 1619, largely from information supplied by Sir Thomas Roe [71 n. 8], whom Baffin accompanied on the voyage home from India. Though greatly superior to other published maps of the period, and for a long while the main authority for other geographers, Orme's remark that "This map is curious for knowledge misplaced[1]" was certainly justified, with, for example, Lahore on the banks of the Indus, and Attock 80 leagues to the south. It is interesting to compare Baffin's map with that of Monserrate; they have practically nothing in common; whilst Monserrate has a very fair idea of the Jumna, he reduces the Ganges to a mere tributary, strangely misplaced; Baffin's Ganges on the other hand, is very well shown, but his Jumna rises about twenty miles west of Delhi[2].

With a neat humour, Baffin inscribed the following text below his map heading, "*Vera quae visa; quae non, veriora*"[3], which no doubt referred originally to the superiority of divine faith over material vision.

Nearly 100 years later, Herman Moll published in "London, in the Savoy; MDCCXXII", a work entitled *A Compleat System of Geography, Ancient & Modern.* The volume for Asia contains 31 maps, and lengthy descriptions of the geography of India as then surmised[4]. There are two maps of India, both on the scale of 200 miles to an inch.

The West Part of India, or the Empire of the GREAT MOGUL extends from Kābul to Pegu, and from the Maldive Islands to Kashmir.

Its most striking features are; first, that it brings the Ganges directly south from a lake, presumably intended for Mānasarowar [72], which is fed by two great rivers, a very different version to that introduced by the Lamas' map a few years later [70–1]. Second, the Brahmaputra is brought from the East through Assam, and the Tsang-po is not shown at all. Third, a river "Guenga", in other early maps the Ganga, rises in the Deccan near Poona, and flows north-east into the Hooghly [45, pls. 3 n.; 13 n.].

The East Part of INDIA, *or India beyond the R. Ganges,* extends eastwards to cover the Andaman and Nicobar Islands, and Sumatra[5].

It shows Assam as "Asem or Acham", and also shows a "Laquia R.[6]" flowing west from "Chaammay Lake" in Upper Burma to join the Brahmaputra [78, 84].

Plates 11 and 12 show two maps by le Sieur Sanson d'Abbeville, Geographer to the King of France, whom Markham describes as "the pioneer of geography in France[7]"; they seem to have borrowed from Baffin's map.

Markham refers to Guillaume Delisle, "Premier Géographe du Roi", as "the principal creator of the modern system of geography", and "the first to publish a map of Tibet [67]". His *Carte des Indes et de la Chine* is dated 1705, and his map of Central Asia, 1706. A later French geographer was le Sieur Robert, Géographe ordinaire du Roi, one of whose maps *Les Indes Orientales*[8] was published in 1751.

[1] Orme MSS. 134 (169). [2] Map, BM. K. 115 (22): reproduced, Terry & William Foster. [3] The things that we have seen are true; those that we have not seen are truer still. Possibly from St. Augustine; cf. II Cor. IV 18. [4] IO. Maps, MS. 87 (451–712). [5] ib. (652) [6] Rennell gives the name "Lukhya" to the W. channel of the Brahmaputra thro' Dacca Dist.; La Touche (46) & *Ben. Atlas* (vi & ix). The name still survives, 78 L/12, 79 I/9. [7] Nicolas Sanson, b. Abbeville 1600, d. 1667; his sons Guillaume d. 1733 and Adrian d. 1718. [8] BM. K. 115 (11).

D'ANVILLE'S MAP OF 1752

An important stage was reached, and the geography of India largely rescued from the vagaries of fancy, when the French geographer, Jean-Baptiste Bourgignon d'Anville, published his map of India in 1752. He had already published, 1751–53, maps of Africa and Asia[1], and it has been written of him;

The critical study of Asia and Africa by D'Anville had recently purged the maps of those continents of all their traditional detail as regards rivers, lakes, and mountains, and left only the coast-lines and such features of the interior as had been seen by European travellers of repute. Little was left in Central Asia, and practically nothing in Africa[2] [cf. pl. 13 n.].

He had compiled in 1733, a *Carte général du Tibet, ou Bout-tan*, based on the maps of the Jesuits at Pekin, and this had been published in Du Halde's great work on China [70, pl. 7]. He had also published, in 1737, a map of the South Peninsula from surveys sent home by Father Bouchet [86, 238–9].

His new map of India was the first to be accompanied by a careful analysis of all authorities used in its construction; it is entitled,

Carte de l'Inde, dressé pour la compagnie des Indes. 1752. 1 pouce 4 lignes au degré. 3 feuilles[3].

His descriptive memoir[4] opens,

Je n'ai dressé la Carte, dont l'analyse est l'objet de cet ouvrage, que parce que Messieurs les Commissaires du Roi à la Compagnie des Indes, m'ont fait l'honneur de me la demander. J'avouerai même, que j'ai d'abord témoigné quelque répugnance à travailler sur l'Inde plus en grand que dans ma carte d'Asie. L'inégalité de nos connoissances sur les differentes parties de l'Inde, leur défaut presque total à l'égard de quelques unes de ces parties, étoient le motif de ma répugnance. ...

Rien ne peut mieux contribuer à perfectionner cette carte, que la discussion par ecrit dont je l'accompagné. Elle met à portée de discerner ce qu'il y a de plus ou de moins solide dans ce que la carte représente; & d'ailleurs les parties qui ne sont point connues se distinguent d'une manière plus franche en cette carte, qu'en toute autre du même continent, en vertu d'une plus grande retenue sur ce qui méritoit d'y figurer. Par là on doit être excité à rechercher de nouvelles connoissances, qui soient propres à reformer la carte en ce qu'elle a de fautif, & à remplir ses voides. ...

Au reste, l'avancement de la Géographie m'étant plus cher que la carte de l'Inde, je souhaite qu'elle ne soit que la préparation à une autre plus exacte et plus complète, qui la détruise en quelque manière, & ne lui laisse d'autre mérite que d' avoir donné lieu à une meilleure. Je serai plus ardent que personne, à rechercher tout ce qui pourra procurer cet avantage[5].

He adjusted his map to all the astronomical positions he could collect, and then built up the detail of coast-line and interior from any records he could find, discussing positions and distances given by writers even as early as Ptolemy and the Arab geographers [207–8], and hardly overlooking any possible source of information [213].

He left the unknown heart of India almost blank, and from the section which covers Bengal [pl. 13] it will be seen how conscientious he was to avoid filling up blanks with imaginary detail, though he did "follow the crowd" in accepting the fabulous River Ganga [209];

Behind these mountains [Western Ghats], as we are told by Barros[6], spring two rivers, Crusuar and Benhorz; the first to the Northward of the other; these rivers uniting in the environs of Andanagar[7]...form the great river Ganga. ... The want of intelligence concerning a great space of country, leaves us without any account of the course of this river, till we take it up again towards the place where it divides into several channels, to get into the Ganges and the sea[8].

It is surprising that he records "an almost total defect of intelligence concerning the course of the Ganges, from its entrance into India, to its reception of the Jomanes[9]" and even in Bengal shows nothing to the north of the Ganges except

[1] *Carte d'Asie*; *Imp. Lib. M & P.* 891. [2] Mill (5). [3] BM. K. 115 (12, 2 Tab.); scale about 50 m. to 1 inch. [4] *Éclaircissemens Géographiques sur la Carte de l'Inde.* [5] D'Anville (vi). [6] Jean de Barros, Portuguese historian [221], author of *Da Asia*, 24 vols, Lisbon, *c* 1560–1613; 2nd ed. 1778–88. [7] Ahmadnagar, 47 I/12. [8] Herbert (39); cf. *Hobson Jobson sv.* Godavery, Kedgeree. [9] Jumna conflux, 63 G/15; Herbert (23).

the points of junction of the larger tributaries, giving no indication whatever of any mountains. On the other hand,

Having material to represent this part of the Ganges, from Ugli[1] to the Sea, with more nicety and exactness, I have filled up a vacant space in the map with a particular draught of that part, upon a scale large enough to admit all the circumstances in which we are well informed[2].

D'Anville's memoir was translated and published with a reprint of his map in London in 1754 and 1759, with annotations by William Herbert[3], Hydrographer [304]. He continued his interest in India, and helped Orme with material for his *History*, and in 1775 published his *Antiquité Géographique de l'Inde*, in the preface of which he thus comments on the great advance of knowledge since his map of 1752[4];

Ce que j'avois prévu s'est effectué; et l'Inde est devenue l'object d'un travail Géographique sur les lieux memes. ... Enfin, la carte de l'Inde dressée dans le cabinet à Paris, s'est vue suivie de plusieurs autres.

Celle qui parut la première à Londres en l'année 68, quinze ans plus tard que la mienne, ayant été enrichie en differentes parties, en conserve d'autres qui sont purement conformés à la carte qui l'a devancée. On lui en a fait succéder une seconde de la partie du Bengale, et en remontant le Gange dans un espace d'environ cent cinquante lieues au-dessus de la division de ce fleuve, et cette nouvelle production avec plus de détail, et quelques changemens en divers endroits. La géographie de l'Inde a été ainsi tirée d'un état presque nul, ou du moins d'une extrême sècheresse, pour arriver à un degré de perfection qu'on n'auroit pas osé espérer de lui donner[5].

JEFFERYS & ORME

The map of 1768 referred to by D'Anville above is obviously one entitled *The East Indies with the Roads*[6], by Thomas Jefferys[7], in four sheets, on scale about 40 miles to an inch, which included surveys by Rennell and others brought home from Bengal by Vansittart and Clive [250]. Jefferys had obtained formal permission from the Directors to publish this map, and their minutes record the receipt of a

letter from Mr. Thomas Jefferys, dated this day, representing that he has attempted in a Map to delineate the extent of the British Dominions in the East Indies, and expressing his hopes that this Court will give him leave to publish it under their patronage[8].

and no objection seems to have been raised to his use of surveys which were rightly the Company's property [251].

Jefferys follows Moll in showing the Brahmaputra by the name Lakia, rising with the Surma from "Chemay" Lake [209]. He shows the Chilka Lake as over 100 miles from the sea, to which he connects it by two creeks, one flowing out by Palmyras Point and the other by Rajahmundry[9].

Robert Orme, the historian, was most industrious in collecting geographical material to illustrate his history [22, 28–9]; and his papers, now preserved at the India Office[10], contain long lists of sketches and surveys sent to him by John Call, Vansittart, Richard Smith, and other friends in India, with notes on geographical positions of important places, lists of geographical names, lists of maps in published books, and various notes on the construction of "our map[11]". His draughtsman was Thomas Kitchen[12], and two sheets of their map, scale 1½ inches to a degree, were published without title in the first volume of his *Historical Fragments of the Mogul Empire*, 1782, with the following comment;

[1] Hooghly, 79 B/5. [2] ib. (30) [3] As purser's clerk had made obsns. in S. India & Maldive Is; Dalrymple. [4] "*Atlas Antiquus* 1784, ..." 12 maps, *Imp Lib. M & P.* (239, D. 29). [5] *Antiquité Géographique.* (Preface). [6] BM. K. 115 (13, 2 Tab.) & *Imp. Lib. M & P.* 519. [7] Geographer to the King; d. *c.* 1774. *Geo. Rev.* I, 1874; *DNB.* [8] CM. 27–4–68. [9] Jefferys' map was used by Brion de la Tour in a map of *La Presqu'ile des Indes*, Paris, 1781; Bernoulli, II (434). [10] Orme MSS. *passim.* [11] Robert Orme, II (68 n). [12] Hydrographer to the King, Author of *Map of India*, Frontispiece, Ives.

Mr. Orme had projected an Atlas of the Peninsula, to consist of about 10 or 12 sheets, of which the two maps inserted in this volume were to have formed a part: but the improvements then resulting from Major Rennell's survey of Bengal, and the marches of the British armies in India, prevented his proceeding in so arduous an undertaking [1].

A small scale map of India, also drawn by Kitchen, appeared with his *History*, 1778 [2].

Orme's map contains various interesting items, such as, across Rajputana, "Hendous, a savage people", and at the debouchment of the Ganges from the mountains "Taglipoor, Streights of Kupele [3]".

Amongst his papers is the proof of a "General Map of Indostan", with a note in his handwriting,

The province of Oude in this Map is placed all wrong. Such was our general want of knowledge in the years 1760 to 1764. I write this May 11th 1778. The Gunga, running thro' Berar and falling at Balasore is from Mr. D'Anville's notion, which we have now every reason believe wrong [209, 210] [4].

After Rennell had retired and started the compilation of his *Map of Hindoostan* in London, he expressed, in a letter to Warren Hastings (who was still in India), his disgust at the manner in which Orme still held much material that he would be glad to get;

The general map of Hindostan is still at a stand for want of materials. It is a provoking circumstance that the Historian O-e keeps up all the Geographical materials in order to extract such particulars only as serve the purpose of illustrating his History: and probably I may either lose my eyesight, or drop into the grave, before he has done with them [5].

He probably got most of what he wanted very soon after, for Orme writes,

Mr. Orme is in possession of several geographical tracts relating to India, which contain curious knowledge, and may on occasions be useful abroad. He suggests their publication with an index. ... To explain this portion of history...a General Map of India is necessary, according to one or other of two forms he now presents. What is done in that, with names, already stands at £40, and when so compleated will, with engraving, come to a great deal of money, perhaps £150, too much for Mr. Orme to ask, but much more than any sale can bear.

Mr. Orme is therefore very willing to deliver what is already done to the Company, recommending that Major Rennell, if he can be induced, may compleat the map, and in such case will assist Major Rennell with all his materials, which he imagines to be a greater collection than any in Europe; and will give a tract of such observations and explanations on the Construction of the map as may tend to the future improvement of this knowledge [6].

RENNELL'S *Map of Hindoostan*, 1782–93

Before he left India Rennell had already conceived the idea of working up a map of India;

It is well known that there are deposited in the India House a variety of Maps...of various kinds; all (or most) of which...appear to be laid aside to perish; amongst this various collection of materials much useful matter might undoubtedly be extracted, was there a proper person appointed to examine it. ... I beg leave most humbly to offer my services towards the selecting, arranging, and (if necessary) publishing as many of these...as the Hon'ble Court may judge necessary.

From the best of the materials I propose to form...A General map of All Hindoostan [7].

He had started this great work whilst his *Bengal Atlas* [228–9] was yet in the engraver's hands, and in March 1782 he writes,

I have another Geographical work in hand, and which is to be published shortly. A Map of All Hindostan, or the Mogul's Empire. ... It is a work much wanted at this time. ... The Map has been just a 12 month in the Engraver's hands; and my illness has not hastened it [8].

In December the Directors record that Rennell

presents the Court with a Map of Hindostan, accompanied by a Book explaining its construction, and proposes that copies should be sent to India, to be delivered at a reasonable price.

[1] Robert Orme (lii). [2] Orme, III (1). [3] cf. D'Anville's *Carte de L'Inde*. [4] OrmeMSS. 33 (9).
[5] BM. Addl. MSS. 29147 (191), 26–1–81. [6] Orme MSS. 150 (101, 104), 10–4–81. [7] BPC. 5–12–76 (5).
[8] HMS. 765, 30–3–82.

Resolved that 30 Books of the best binding, explaining the Construction of Major Rennell's Map, ... with a Map placed in each Book, be purchased for the use of the Directors and the Officers at Home; and that 20 Books, bound in the other manner proposed by Major Rennell be purchased for the use of the Company's Presidencies in India.[1]

Of the copies sent out to India, the seven which went to Madras were carefully sent in seven different ships, each copy "in a box apart"[2].

Rennell thus describes his map and his purpose in preparing it [4–5];

Whilst the theatre of the BRITISH WAR in Hindoostan was limited to a particular province of it, little curiosity was excited towards the general Geography of the Country: but now that we are engaged either in wars, alliances, or negociations, with all the principal powers of the Empire, and have displayed the BRITISH STANDARDS from one extreme of it to the other; A MAP OF HINDOOSTAN, such as will explain the local circumstances of our political connections, and the marches of our Armies, cannot but he highly interesting to every person whose imagination has been struck by the splendor of our victories, or whose attention is rouzed by the present critical state of our affairs, in that quarter of the globe.

That, which I now offer to the public, is intended to answer the above purposes; all such minutiæ as tend rather to introduce confusion than to illustrate the general system being omitted; and the particular Geography of each province left to be hereafter explained in separate maps, on more distinct scales; in the same manner as Bengal, Oude, etc. are already done.

I am aware that I shall incur some censure for using so small a scale on the present occasion; as many people who peruse maps without reflecting on the nature and intent of their construction are too apt to expect a large extent of country, and all the minute particulars of it, in the same map [33]. ...

The MAP is contained in two large sheets, which may either be joined together for the purpose of bringing the whole into one view, or bound up separately in an Atlas. ... The scale is one inch to an equatorial degree[3]: and as the whole map is a square of more than 30 such degrees, its surface will be found to contain a space larger than all Europe. ... The whole construction is entirely new. ...

I have been enabled by means of observations of Longitude taken at Bombay, Cochin, Madras, Calcutta, Agra, etc, together with measured lines and surveys extended from the above places, to frame a very good groundwork for my map. ...

We must not go much farther back than 30 years for the matter that forms the basis of this map; and it must not be forgotten that the East India Company have caused a a mathematical survey to be made at their own expence, of a tract equal to extent to France and England taken together[4] [226, 228].

In spite of the great advance of geographical knowledge, Rennell still found that for many areas he was little better off than D'Anville, of whom he writes,

When it is considered that this excellent Geographer had scarcely any materials to work on for the inland parts of India, but some vague itineraries and books of travels, one is really astonished to find them so well described as they are[5].

Wide areas were still completely blank, or dependent on the journals of casual travellers; and even where routes had been measured, very few were accompanied by astronomical observations [215]. The *Memoir* shows how he had to juggle with the material at his disposal to get positions for his principal points that would best fit his more trustworthy data, and, as Everest wrote in 1838 nearly sixty years later,

By what unwearied exertions did not the patient and judicious Rennell strive to reconcile the jarring and discordant data[6] on which the map that was accompanied by his Memoir is founded[7].

Plate 14 shows the area of Bengal and Assam taken from this map of 1782[8].

In 1785 Rennell issued a second edition of the Memoir, which now included his *Account of the Ganges and Brahmaputra rivers* [79 n.6] and several new maps, one of them covering the marches of Fullarton and Humberstone [98–9]. This edition was translated into German and French, and published with a reproduction

[1] CM. 4–12–82. The map is dated 1782, and *Memoir* 1783. [2] By ships sailing in Jan. 1783. CD to M. 15–1–83 (45, 46). [3] viz, about 69½ British miles to an inch; cf. D'Anville's map, "1 pouce 4 lignes au degré" [210]. [4] *Memoir*, 1783 (Preface). *Memoir* reviewed in *Eur. Mag.* III, 1783 (52), and Bernoulli, II (464–92). [5] *Memoir*, 1788 (vii). [6] Fully discussed in the *Memoir*. [7] Everest (75). [8] Copy of 1782 map wrongly bound as frontispiece to 1793 *Memoir* in GBO Lib. Ha 6.

of the 1782 map, by Jean Bernoulli, as the third volume of his *Description Historique et Géographique de l'Inde* [72].

In 1788 Rennell published an entirely new and enlarged map[1] and *Memoir*, of which he writes;

The flattering reception that was given to my former work...has, in a manner, made that an object of duty, which was originally an object of choice...

I have been enabled to produce a work of a more perfect kind than the former. ... The scale of this map is one inch and a half to an equatorial degree[2] [248]. ... It is contained in four large sheets, which may either be joined together for the purpose of bringing the whole into one point of view, or bound up separately in an Atlas.

This map was a great advance on the earlier one, for a mass of new material was now available; there were the marches of the armies during the Mysore war, more especially Fullarton's route across the south peninsula; Pearse's marches along the east coast, and Huddart's observations along the west; Ewart's survey to Nāgpur, and Tieffenthaler's surveys of the Ganges and Gogra [pl. 6].

In short, additions and corrections are disseminated over the whole map; and in general, if we except the fourth part of Berar, the Western part of the peninsula, and the countries bordering on the river Indus, and the Punjab, the map is filled up in such a degree, as to have no considerable blanks in it. ...

Could the whole mass of geographical matter that respects India (much of which is probably in hands of people who are ignorant of its value) be collected, I make no doubt but that very complete maps of the several provinces of it might be constructed, on scales large enough for any ordinary purpose[3].

In a letter to Warren Hastings he tells of changes he has made to the geography of the Punjab;

The next grand correction is that old position of Lahore, Jammoo, and the mountains towards Tibet. All of these are more to the West and South-west, and thereby allow greater space between the upper part of the course of the Ganges and the Punjab, a fault I discovered long ago, ... but could not tell how to correct it. It now appears, indisputably, that we have not allowed space enough, by $1\frac{1}{2}$ or 2 degrees of Longitude for the north-west part of Hindoostan, and the space between Candahar and the Caspian must be proportionately reduced[4] [148–9].

The *Memoir* now contained an introduction of 123 pages giving an *Historical and geographical account of the political divisions of India*; a new map entitled *The Countries situated between the Source of the Ganges and the Caspian Sea*, which showed Forster's route [233] on the scale of $\frac{3}{4}$ of an inch to a degree; and a small scale *Map of the Inland Navigation* of Bengal [230]. It also contained a *Table of Distances in Hindoostan* covering the whole of India, with a map of the principal roads and political divisions on the scale of 200 miles to an inch [pls. 1 & 21]; and a postscript entitled *Correction to the Geography of the Indus, and its Delta etc.* Each edition of the *Memoir* contained an index of place names, referred to map squares.

In 1792 Rennell issued a *second* edition of the larger map and memoir[5] which now embodied Reynolds's journeys through Mālwa and the Deccan [127], but as the new information for north-west India would have involved entirely redrawing and extending that area of his map, he added a new map on the same scale, with the title *The Countries situated between Delhi & Candahar*... [pl. 8 n]. The second edition of the *Map of Hindoostan* was given coloured boundary ribands.

In 1793 a *third* edition of the *Memoir*[6] and *Map* was issued which did not differ in substance from the last; but in order to cover the changes and fresh surveys made during the Mysore war of 1790–92, a new map and memoir[7] of the Peninsula south of the Kistna were issued separately [243–4].

[1] Map, MRIO. 96 (29, 30); BM. K. 115 (15, 2 Tab.). Portion covering Central Provinces reproduced, Wills (front pocket). [2] About $46\frac{1}{2}$ British miles to an inch. [3] *Memoir*, 1788 (i, iii, ix). Preface dated 1–3–88. [4] Always the same old trouble over longitudes. BM. Addl. MSS. 29193 (516). [5] Preface signed 22–11–91. The editions of *Map* were, 2-sheet map: 1782. 4-sheet map: 1788, 1792, 1793; of *Memoir*, 1782, 1785, 1788, 1792, 1793. [6] Preface signed 21–1–93. [7] This memoir was bound into some copies of the main 1793 *Memoir*.

These two last editions of the *Memoir* ran to 614 pages[1], making a monumental work which gave a complete account of the sources of all the geographical material used in the map; the map itself was out of date almost as soon as it was published; British rule was extending rapidly, and with it came fresh opportunities for the surveyors, who took Rennell's map as the standard by which to shew the value of their new work. No one realised this more than Rennell himself, and the finest appreciation of his *Map of Hindoostan* is given in his own words written 15 years later;

Believe me, Sir, when I say that I pride myself on nothing so much as on having originally laid a foundation for the Indian Geography, and which is all that I pretend to, for at that day we were compelled to receive information from others respecting the interior of the country, but in your time you *explored* for *yourselves*. I have only the merit of furnishing a dim light by which others groped their way[2].

The value of the *Memoir* long outlived that of the *Map*[3], and as late as 1824 Blacker asked sanction to purchase a copy for the Surveyor General's office;

Major Rennell's Memoir is the only Memoir of Construction of any Map of India with which I am acquainted, and such is the backwardness of Indian Geography in some directions, that I regret to say it is still occasionally the best authority procurable[4].

THOMAS CALL'S ATLAS, 1782–9

Whilst Rennell, in London, was engaged in preparing his *Map of Hindoostan*, his successor in Bengal had, under Government orders of 1779, already started to compile a complete "general plan" [235, 261]. In 1783, in reply to an order, probably inspired by Rennell, to send all available surveys home to England [251–2], Call wrote to Government,

I have in hand an Atlas of India formed from a variety of materials, such as original Maps, actual Surveys, Routes, Marches of Detachments, Journals, Reports, informations furnished by travellers, Histories and Voyages.

This Atlas, though not finished, is in a state to convey much new and useful Geographical knowledge of this country; it will be divided into 20 sheets, afterwards the whole reduced into one portable sheet sufficiently large to exhibit all rivers, capital towns, Roads, and the grand and sub-divisions of the Empire. ... It is constructed from a variety of Authorities, more or less to be depended on, according to circumstances; it would require a Volume in folio to explain them and shew why I preferred this and rejected that. ...

I am sensible to the Merit and abilities of Major Rennell, who has lately published a Map of India [213], ...yet it will be no disparagement to him or his work, to say that, being on the spot, I have, since his departure, had an opportunity of rendering my Map of India much more complete that his, and further that, was he furnished with all the materials I have procured, it would take him nearly as much time to compose the Work as it has taken me, which would be so much time lost.

If I send home the Maps...in the state they are, having no copies of them, I shall be unable to proceed with the continuation of them[5].

Call was permitted to continue work on his map, and in the following year laid it before the Board that they might see the progress made;

It is in a rough state, but I have kept it as long as possible in one sheet for the convenience of correcting it as fresh materials were sent in. It will soon be divided into 16 or 20 sheets, and copied fair.

After describing various new surveys and routes which he had introduced "much of which was obtained from Friends and Natives at a very great expence", he asked for twelve months to make the copy in separate sheets, whilst

to insert the fresh materials will take three months; to fill up such parts of the Atlas from Original Plans as now appear only in Lines will require about 3 months, so that altogether it will take near eighteen months[6].

[1] *Memoir* of 1783 had 99 pages only. [2] to Warren, 1-3-1808. MPC. 18-7-1809. [3] Though the map is of immense interest now for a study of old locality and place names. [4] DDn. 204 (72), 5-7-1824. [5] BPC. 6-10-83 (21). [6] BPC. 14-2-85.

Government thereupon ordered him to drop the collection of fresh material [38], and asked how long it would take, and how much it would cost, to finish off the compilation and prepare the reduced copy; to which he replied that the map was now in one sheet on the scale of 15 geographical miles to an inch [248], and

> To complete my rough General Map from the materials in my possession, and prepare it for copying fair ... ... Rs. 4000
>
> To make a reduced copy...on a scale a little larger than that already made and published by Major Rennell [213 n.3]; first in rough, afterwards a fair copy to be made and sent to Europe ... ... Rs. 8000

which he engaged to finish in 12 months[1].

In 1786, on his appointment as Chief Engineer, Call left Wilford to continue work on the map, and reported,

> The Map is at present in one sheet and in a very rough state owing to the frequent corrections it has undergone; to preserve a work that has been of so much expence to the Hon'ble Company, it will be necessary to divide it; this can easily be done under the inspection of my successor in office[2].

and again,

> I...recommend...that a fair copy be made of it in 12 or 14 sheets on the scale it is now laid down at, viz: about four inches to a degree.
>
> The fair copy should be kept in the Council Chamber to assist the Governor General in Council in ascertaining the position and distance of places, as also to preserve a work that has been attended with much labour and expence.
>
> A reduced copy of the Map should be made on one sheet on a scale large enough to shew all Capital Towns, Rivers, and Boundaries of provinces, leaving out all the minuter parts.
>
> Each member of the Supreme Council should be furnished with a reduced copy; the first will be attended with some labor, but afterwards copies can easily be made by draughtsmen. ...
>
> The West and North-west parts of India will soon be much improved by the Surveys of Captain Reynolds, Surveyor on the Bombay Establishment, who has promised to send me all the surveys he has taken[3] [253–4].

On taking over office as Surveyor General, Wood asked Government to write to Madras and Bombay for all the surveys they could send in, that these might be added to the map before it was fair copied [254], and in April 1788 reported,

> It was first imagined that this work would have been completed in 12 months, and, had merely a copy of the former Plan been required, it would have been finished within that time. Independent of the unwieldy size of the map, which rendered it impracticable to be placed on any glass, on cutting it into 12 sheets, it was discovered that the paper had shrunk in many places near a twelfth part of a degree.
>
> In the forming of the New Plan, it was by this means rendered necessary, not only to make all the projections again (which was a work of great labour and difficulty), but likewise to compare the several situations and distances.

After describing the introduction of further fresh material, Wood continues;

> A comparison of the present Atlas with the original copy will be surest test of the labour and difficulties which have retarded its progress, and which have been little short to Mr. Wilford to what he would have had in compiling a New Map. ...
>
> I have...added a 13th sheet, ... showing the division and extent of country contained in every sheet, ... and which shall also contain a concise account of the Principal authorities from which the map has been compiled. ...
>
> The Atlas in 13 sheets for the Council Chamber has at last been completed, and I only wait for the insertion of the authorities, and a book for arranging the several sheets to present them.

The amount of labour in making copies of these thirteen sheets was colossal; one copy was required for the Governor of Madras; another for the Directors. As for the reduced copy on one sheet, with a copy for each member of Council,

> The projection of the degrees, which is a tedious and most difficult part in the construction, ... is finished, but no further progress is, nor can be, made till such time as the General Atlas is finished[4].

In 1788 Call was allowed to return to England on account of ill-health, and given permission to take with him twelve sheets of "the Grand Atlas of India" to

[1] BPC. 15–9–85. [2] BPC. 7–2–86. [3] BPC. 13–2–86. [4] DDn. 16 (9), 6–4–88.

present personally to the Directors; one sheet, that of Bengal, could not be got ready in time. He died on the voyage, but all his papers and the atlas reached England safely[1].

Further complete copies of the atlas were sent home, and in September 1791, Rennell was asked by the Directors to report whether it was worth engraving[2]. He was at this time awaiting issue of the final edition of his own map, and in a position to realize the endless business of trying to keep a map up to date. He found that many of the latest surveys, particularly from Madras and Bombay, had not been incorporated in Call's map, though they had already reached England[3]. There was no memoir explaining the construction, and the map would be obsolete before it could be engraved. The atlas, on which so much time and labour had been spent, was therefore abandoned, though the copies which had been kept in India were of great value, especially in the Surveyor General's office for the preparations of other maps [219].

The sheets of Call's atlas are still preserved at Calcutta in excellent condition, and are most interesting to study[4]; being on so much larger a scale than Rennell's maps they show far more detail, but, except in certain areas, the lack of scientific control, of which Call was fully aware [157], is most evident.

REYNOLD'S MAP, 1793–1807

Yet another map was to be created with vast labour and expence, borrowing nothing from maps that had gone before, but being laboriously worked up from such material as one man could collect, and fated never to be printed or published.

Charles Reynolds, Surveyor on the Bombay establishment, was for many years the only surveyor with any knowledge of the Marātha countries of the Deccan and western India, and compiled his first map of those regions in 1787 [127]; his journey through Hyderābād to Madras in the following year inspired him with the desire to "form a General Survey of India" [128], but he was not able to press the matter till 1793, when he visited Calcutta and obtained the Governer General's approval to his scheme. We have, unfortunately, no copy of his proposals, but he says that

> in the memorandum I laid before Sir John Shore, my proposal to Government was not of a partial nature, but was to complete the whole Geography of India[5] [282], ...

and further that,

> the map I am about is of very extraordinary size. The sheet on which it is constructing has a superficies of 400 square feet, and will develop the whole of India in a very distinct manner from the Mountains of Cashmere to Cape Comorin, and from the Western frontier of the Bengal Provinces to the the Western side of the River Indus, an attempt I believe that very few would make, and fewer I believe succeed in[6].

The Directors approved that he should produce

> a complete general map, with separate maps of each district on a large and expressive scale, with a topographical description of the country[7], ...

and in December 1796 the Bombay Government wrote home,

> Major Reynolds remarked that your Hon'ble Court expected from him, and he had pledged himself to furnish, a map of India, which was to contain 13 provinces, all equally out of the Company's Government, and consequently much more difficult of access, and of much less personal security, and he did not imagine that either the Governments in this country, or your Hon'ble Court, would be inclined to accept a work from him which should prove much inferior to Major Rennell's, nor indeed could he hold himself acquitted as to his engagements was he to attempt to impose such a work upon them; Major Rennell had established his character as a Geographer by his performances, and he (Major Reynolds) hoped that his would give him an equal claim to the favour of the public should they ever be published by the permission of your Hon'ble Court. ...

[1] From John Call to CD. 22–5–93; Misc. LR. 89 (207). [2] The Directors always regarded Rennell as the right man to make a General Map of India [252]. [3] Century Series (97). [4] *General Map of India*, in several sections, by Call & Wilford; 16 m. to 1 inch. MRIO. 95 (32–53). [5] DDn. 146 (27), 24–12–99. [6] Bo MC. 24–4–98. [7] CD to B. 8–7–95 (95).

We have recently received a letter from Major Reynolds giving cover to the rough sheets of his intended map of Hindoostan. ... Major Reynolds regretted that he had not been able to lay the whole of his information before us on the different sheets; ... he assured us that his information of the other provinces is generally in the same state of forwardness; ... the scale of it[1] is four times larger than Major Rennell's maps of the Bengal Province, and notwithstanding this considerable difference, his map, in the present unfinished state, is in general as much filled up as that Gentleman's are; ... there are in general but few blank spaces, and, even where they occur, surveys are now carrying on for the completion of the sheet before us. ...

In conveying...this communication from Major Reynolds, we...accompany it with our testimony in favour of the minuteness and apparent accuracy of that Gentleman's Geographical delineations, as far as we can judge by the Specimen of that part of his general map which he has submitted to our inspection of the North-western part of India, comprehending the Gulphs of Cutch and Cambay, and including part of Malwa[2].

In 1798, Reynolds laid before the Governor "the rough sheets of a considerable part of my intended map of Hindostan"; and explained that he was still collecting material for the remaining sheets through the agency of native surveyors [287–8], and in order to avoid having to re-survey country already known he asked that he might be furnished with copies of other surveys[3]. The Directors however ruled that,

The map in which Lieut. Colonel Reynolds is engaged must be considered as referring to his own observations, or Collections of the country surveyors employed by him, and not to include any combination of the surveys made by other persons at our expence[4] [225].

For twelve years from 1795 to 1807 Reynolds continued at his map compiling the work of his native surveyors as they came in; though he frequently pressed for an officer to join him as assistant none could be spared till 1801. He spent a fortune from his own money on this collection of material, and said that the sum which Government eventually paid to him, after repeated submission of his claims, did not in any way meet his expenditure [282, 288]. When the Directors complained of the inordinate time that had elapsed without the work appearing to draw any nearer to completion, Reynolds pointed out the wide area that his surveys covered, and that he was working single-handed;

It must therefore be very easily understood that the accumulation of information...could only add to my embarrassment; the second reason for the increase of expence was the menacing posture of Zemaun Shaw for some years, and the anxiety of our Government in consequence of it [8, 55, 57]. This led me to make a more particular investigation of the frontier of his country towards Hindostan, [and] of his tributaries within the Indus, some of whom extend almost to the Western boundary of the Soobah of Dehly, of Sind, and of the Baloche country adjoining the Indus on the West and North-west from Buchin. ...

Were I to specify the different places through which the Surveys have been carried, it must prove unsatisfactory, as they [the Directors] would not be able to trace them on any map now extant, and of course would be as much in the dark as ever. ...

The different routes executed by myself and people, amount at present to 150 or 160 thousand miles, and the enquiries made from different points of these routes will occupy as much, and in all probability a great deal more.

From the above recital, the following observations present themselves;

That the Hon'ble Court of Directors have authorised my pursuit, and in consequence expect from me a completed map, besides separate maps of each province on a large and expressive scale.

That it became a duty on me to adopt the best means to effect this. ... That I never expected to realize the necessary information for it until the present year. ... That an attempt to hurry its conclusion must defeat the intention. ...

That the people employed out are beyond the power of recall. That in my proposal...I particularly stipulated for my assistant being constantly under my orders. That since the above sanction, I have had no assistant with me. ...

That such a map cannot be arranged by one person; that to enable me to meet the wishes of the...Court of Directors, it is essentially necessary that Captain Moncrieff should join me as soon as possible, and that it will add very much to the dispatch of the work if I am allowed a second assistant[5].

[1] 9 inches to a degree. [2] Bo to CD. 10–12–96 (195–204); DDn. 146 (5/17). [3] Bo MC. 2–2–98.
[4] CD to Bo. 29–5–99 (29). [5] DDn. 146 (42), 17–4–1801.

At length in 1801 Moncrieff joined him at Surat, and other assistants were posted shortly after, but even so the map was not sufficiently advanced to allow him to leave the country before 1807. He took one copy home to present to the Directors in person, and after a few additions had been made to the copy left in Bombay,

Copies of a portion of Colonel Reynold's General Map of India, drawn on a scale of 9 inches to a degree, and contained in 20 sheets, were forwarded to the Right Hon'ble the Governor General on the 4th February 1809[1].

The remaining 16 sheets were not copied for the Supreme Government, but the whole map was redrawn with the addition of other material, and submitted by the Bombay Government in 1821. Although never published, this magnificent compilation formed the basis of all maps of Western India for many years, but no complete copy has been preserved, and its exact extent is not known[2].

James Welsh gives the following account of Reynolds at work on his map;

In his hall I had the gratification of *crawling over a map* fourteen feet long and ten feet broad; to do which, without injury to a production intended to be presented to the Court of Directors, he furnished me with silk stockings for hands and feet; and cased in these I moved about at pleasure, stopping at particular spots for information, which was immediately obtained from a library of immense folio manuscripts in his own handwriting. So laborious a work I never could, without ocular demonstration, have believed to be the production of one European, in such a climate as the East Indies; and with only two assistants he was now making another map on a larger scale, which, when completed, was to measure 30 feet by 20[3].

The following extracts from a letter written shortly after Reynolds' departure indicate some of the corrections made to the maps of India by his surveyors;

All the maps that have hitherto been given to the World contain so erroneous and imperfect an exhibition of the countries which lay to the N.W. of a line drawn from Ahmedabad[4] in Goojerat to Hurdwaur under the Mountains through which the Ganges enters India, that it would certainly be extremely unsafe...to draw conclusions from their information. Fortunately however Colonel Reynolds' works are nearly as perfect in particular throughout this region as they are with respect to any other part of India.

Major Rennell's latest edition is unquestionably the best map of India that has ever yet been published. ... In Major Rennell's and every other map at thfs time published, an unbroken range of high mountains, as strongly characterized as the Ghauts of Mallabar, is exhibited as running upwards of 500 miles parallel with the Indus, and about 50 miles eastward of that river; no such mountains exist, and the improvement with respect to them is not of greater importance than the corrections made by Colonel Reynolds in several other instances. ...

Colonel Reynolds has discovered that the area shown by Rennell as uninterrupted Desert between Jodhpur and Indus contains many hamlets, villages, and wells. ...

There is a formidable range of mountains, equal in magnitude perhaps, to the ghauts of Mallabar running parallel, on the West side, with the Sind River[5] from the bank of which it seldom recedes more than 50 miles, & often approaches within 15 miles. ...

The river Ghauggar[6]...does not run over the Desert to the Sea as supposed by former geographers, but loses itself in the sand near a place called Seersa[7] on the Eastern borders of the desert[8].

COLEBROOKE & OTHERS

In spite of the frequently declared policy of the Directors that all surveys should be sent to England for compilation there, it was almost impossible for an officer in the position of Surveyor General to resist the temptation of putting together the surveys that he had in his office, the more so since he was being continually called upon to supply maps of different areas, and it was far easier to trace these off a general map that had been carefully compiled at leisure, than to compile afresh from original surveys at each call [217].

[1] From Williams to Govt. 3–2–1815, Bo MC. 3–5–1815. [2] A fragment, "Original protraction Agra to Delhi, and westwards to Ajmer", MRIO. 95 (28); A list of maps by Reynolds that were in SGO. Bombay in 1833 is given in MRIO. M. 564. [3] Welsh, I (243). [4] 46 A/12. [5] Indus R. [6] Ghaggar R. [7] Sirsa, 44 O/2. [8] From SG. Bombay to John Malcolm, 13–4–1808; HMS. 737 (645).

It was not long before Colebrooke started his own map, and in 1795, he tells Government that he has commenced such a map on the scale of 16 inches to a mile[1]. Four years later he reports that,

Having made considerable progress in the construction of a new General Map of India, and particularly in that part which comprises the Carnatick, Mysore, and Northern Circars, in which I have nearly inserted all the Surveys and Materials that had been obtained so late as the year 1793, I now beg leave to inform you, that as this map is intended for the use of the Supreme Government, it would be a desirable object to have it completed from the surveys of a more recent date...in consequence of the late partition of the Mysore Country and Malabar Coast[2].

This map again was destined never to be completed or published.

One more map of India may be mentioned, published in London in 1788 by William Faden, Geographer to the King [243]; it was entitled *Hind, Hindoostan, or India*, and was compiled by L.S. de la Rochette, and published on a scale of apparently $\frac{3}{4}$ of an inch to a degree, about 130 miles to an inch. It bears the following advertisement. For the new and interesting particulars with which this map is enriched, especially in the northern parts, we are chiefly indebted to the Geographical description of Father Joseph Tieffenthaller, Apostolic Missionary in India, and to the curious draft of the Ganges and Gogra by M. Anquetil du Perron [11–2]. The new Chronographical map of the Southern Countries of India by Colonel Kelly has enabled us to Reform, in several districts, the geography hitherto adopted for the Southern part of the Peninsula.

The title is supported by a fine picture of palm trees, Indian jungle, and a very fat elephant with tusks that appear to be at least 10 ft. long[3].

POSTSCRIPT. Of other Greek geographers and historians who described India [207] we may mention Strabo, whose *Geography* was written between 17 and 23 A. D., Book XV treating of India and Persia;—Pliny the Elder, whose famous work on Natural History contained Books III to VI on Geography and Ethnography,—and Arrian, whose principal work was a history of Alexander's expedition, from which the following extracts are given;

The Indus is the largest of all the rivers of Europe or Asia, except the Ganges, which is also in India. It receives its rise from the skirts of Mount Parapamisus or Caucasus, and discharges its water southwards into the Indian Ocean. It has two mouths in a low marshy soil, like those five of the Ister [Danube]; and it forms the figure of the Greek letter Δ,

The country eastward from the river Indus is what I call properly India. ... India is bounded on the north by mount Taurus; which mountain retains the same name, even in that country; it rises on the sea coast near Pamphyllia, Lycia, and Cicilia, and extends itself in one continued ridge, as far as the oriental ocean running quite through all Asia. In some parts, nevertheless, it is called by other names; for in one country it is named Parapamisus, in another Emodus; in a third Emaus; ...The Macedonian soldiers, who accompanied Alexander in his expedition, called it Caucasus [67].

Eratosthanes...tells us that India, from mount Taurus, whence the river Indus has its rise, to the mouths of that river and the ocean, is thirteen thousand stadia. Another side, namely from the same mountain to the eastern ocean, he reckons scarce equal to the former, but as a huge tract of land runs out four thousand stadia into the sea, it may be reckoned six thousand stadia that way; and this he calls the breadth of India. The length thereof, from the westernmost part to the city Palimbothra, he tells us he has measured, along the road called the King's road, and that it contains ten thousand stadia [10][4].

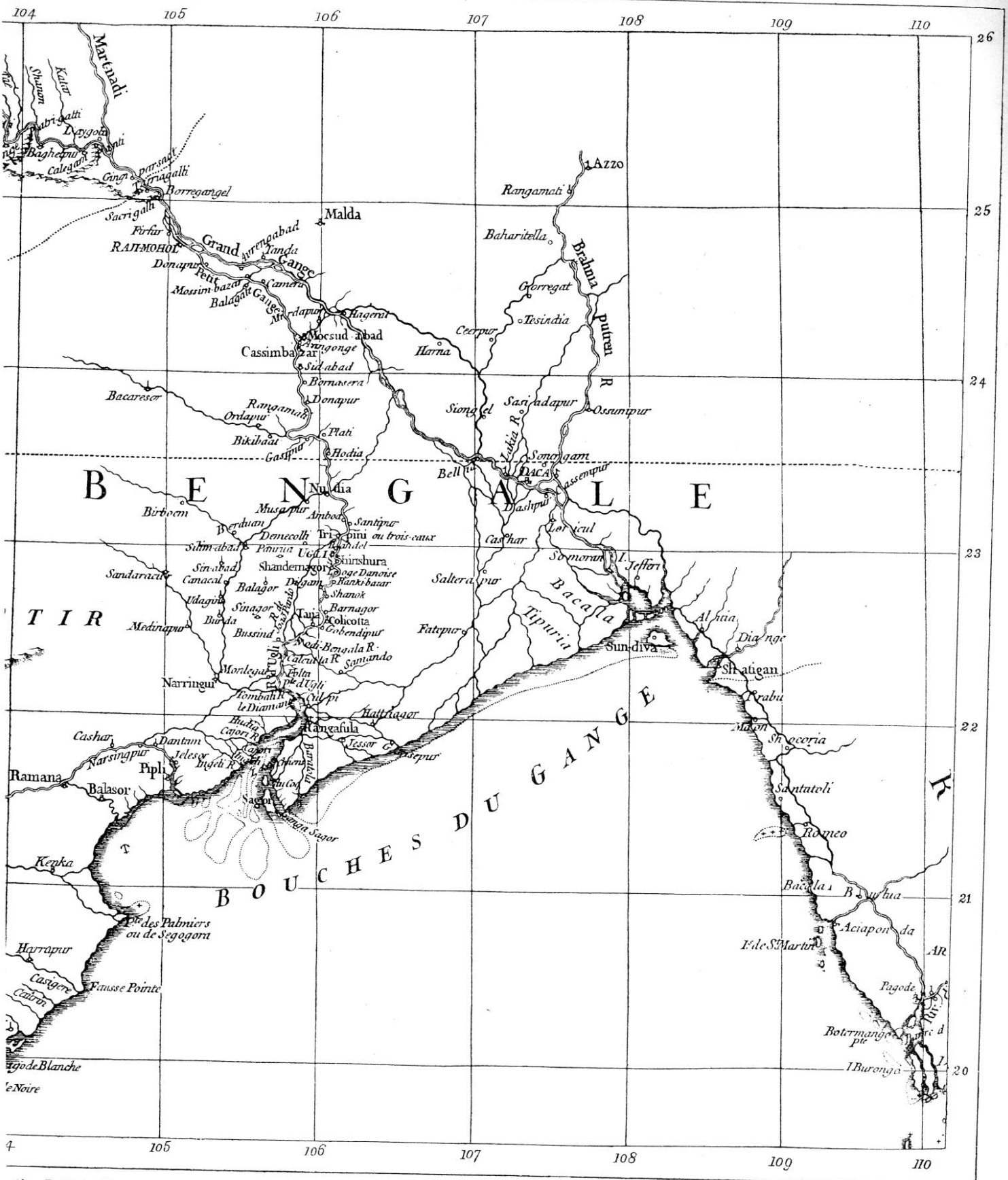
An account of the Arab and Persian geographers of the 8th to the 14th centuries A.D. is given by Dr. James Bird in a paper which appears in the *Transactions of the Bombay Geographical Society*, vol. II (58-72), 1844. The paper is illustrated by a coloured map of Afghānistān and neighbouring countries, from the Oxus to Sīstān, taken from a work by Abu Ali Ishak, commonly known as Istakhāri, who flourished about A.D. 358, and preceded Ibn Haukal [208, pl. 4]. Like other Arab maps this is entirely diagramatic.

[1] BMC. 30–3–95 (19). [2] BMC. 26–11–99 (56). [3] BM. K. 115 (16). [4] Arrian (127, 207, 208).

BENGAL

from D'Anville's CARTE DE L'INDE 1752.

Plate 13



the British Museum, K.115 (12) 2 Tab. by permission of the Trustees.

ee note on Plate 3.

carries an inset showing the Hoogly River

Published at S.I.O. Dehra Dün.

Plate 14

BENGAL and the BRAHMAPUTRA from Rennell's Map of Hindoostan, 17



CHAPTER XV

MAPS OF BENGAL

Maps before Rennell — Rennell's Early Maps, 1764–72 — Rennell's Provincial & General Maps, 1772–4 — Bengal Atlas, *1779–83 — Distance Tables — District Maps — Upper Provinces, 1797–1800 — Punjab & Afghānistan, 1786–1804 — Map Drawing & Draughtsmen.*

THE earliest known map of Bengal was compiled by, or for, the great Portuguese historian Jean de Barros about the year 1550. It extends from *Orixa* on the west to *Tipora* on the east, on scale just over an inch to a degree; amongst places that can be recognised are *Chatigam* (Chittagong), *Satigam* (Satgaon), and *Sirote* (Sylhet)[1].

There is another old Portuguese map[2] which places the city *Bengala* so close to *Xatigam* (Chittagong) that they appear to be identical, whilst an Italian map of 1603 by Vignola [208] shows it on the southern bank of the Karnaphuli, or Chittagong River, as also does the first Dutch map, which appears in van Blaev's *Theatrum Orbis Terrarum* of 1650.

In 1660 appeared van den Broeck's[3] map of *Bengal and Arracan*, said to have been "the fullest and most accurate map available for those days"; it faces p. 146 of Book IV of François Valentyn's *Ond en Nieuw Oost Indien* published in 1724 and extracts have been re-published more recently[4].

The Imperial Library at Calcutta has two old maps[5] entitled *Sinus Gangeticus vulgo Golfo de Bengala* and *Royaume de Bengale et les Pays voisins du Gange, situé entre le Mogolistan*[6] *et le Pegu*, whilst the British Museum holds a map of the *Province of Bengal*, 1680, by William Hacke[7], on the scale of 12 English leagues to an inch[8].

Nothing is known of a map which D'Anville refers to when describing the Cossimbāzār River in 1752;

> The places on the above-mentioned branch of the Ganges are drawn from an English map, which has furnished me with some other particular circumstances, notwithstanding there are several mistakes in that map[9].

The Imperial Library holds an old English MS. map, scale about 50 miles to an inch, stretching from Benares to Masulipatam, and showing the main province names and a few important towns; Calcutta does not appear[10].

Coming now to the period of English ascendancy after the battle of Plassey, our first two maps are by Frenchmen; one of these is a MS. map signed by Charles de Terranneau, and listed by Orme as "From Delhi to Calcutta, a very strange kind of map[11]". It shows the route between Calcutta and Delhi, with the general lie of the country from Bundelkhand to the Himālaya mountains, and main rivers and roads. Towns are shewn by red castellated symbols or flags. The *Goomty* [29 n. 6] rises from a lake called *Poullaule Tallore*, and the Gandak and Bāghmati from hills north of Patna; the lower part of the *Sone* and the rivers of Bundelkhand are shown in fair detail. Hills are shown by lines of artistic pyramids.

[1] Map faces p. 451 *Da Asia*, IV [210 n.6]; also frontispiece, Campos. [2] Facing p. 128 of Thevenot's *Voyages Curieux* [118 n.3]. [3] Mattheus van den Broeck, Dutch Director of Trade, Bengal, 1658–63; Member of Council, Dutch East Indies, 1763–9. [4] *Ben. P & P.* 1936 (54); Seton Kerr, V (frontispiece). [5] *Imp. Lib. M & P.* 411 & 502. [6] Mughal Empire of Delhi. [7] Issued MS. marine charts & atlases from Wapping, London. [8] BM. K. VI, 1 (57). [9] Herbert (30). [10] *Imp. Lib. M & P.* 337. [11] Orme MSS. 67; BM. Addl. MSS. 15739 (1).

In 1770 Rennell wrote home describing the extent covered by his surveys;

This has been all formed into Maps and sent home to be engraved for the use of the Company's servants, both civil and military, but I doubt if the Directors will suffer them to be made so publick [1] [256].

It was in fact many years before his surveys became available for soldiers and district officers, who were seriously handicapped by the lack of maps, as shown by the following minutes of an enquiry into the conduct of the Rohilla compaign of 1773-4. Clavering, Monson and Francis, of the newly-formed Supreme Council, protested against the expedition;

We found that our army about the beginning of this month was stationed upon the skirts of the Mountains of Tibet, at a place so distant from our frontier [2], and so considerably to the North of Delhi, that it is not comprehended in any of the ordinary maps of Indostan [3].

In his reply defending the campaign Warren Hastings wrote,

I think it incumbent upon me to remark a small geographical error, which I have committed in my report of the situation in Ramghaut [4], which I found laid down in my own handwriting upon an old map in my possession at the distance which I have described (60 miles from the border of Oudh), but having since received a more correct map of that quarter from Capt. Rennell, the Surveyor General, which accompanies these papers, I find that it is near 40 miles more remote [5].

The Quarter-Master-General was cross-examined;

Q. What is the distance from Shawbad [6], the frontier of the Province of Oude, to Lalldang, the extremity of the Rohilla Country?
A. I believe it to be about 200 miles.
Q. Do you know the latitude of Lalldang [7]?
A. The latitude I think is 30° 48′ N.
Q. How far do you reckon it to be from Lalldang to Delhi?
A. Delhi I believe is in 28° [8]. ...
Q. Had you any map of the Rohilla Country furnished by the Governor when you went to the Army?
A. No. I believe there were very few extant. I applied to the Governor for such as he had of the Upper Country, i.e. of the upper parts of Bahar and the Province of Oudh, and he informed me the only one he had, he had promised to Capt. Toone [9].
Q. Do you know if Colonel Champion [10] was furnished with maps of the country?
A. I believe he had some maps of the Country, I have seen scraps of them, but he did not communicate them to me [11].

RENNELL'S PROVINCIAL & GENERAL MAPS, 1772–4

Early in 1774 Rennell submitted a full set of all the maps he had completed, which was sent home, and is now preserved at the India Office in excellent condition [12].

The maps were classified in three series; first, a series of 19 *provincial* maps, mostly on the scale of 5 miles to an inch, with 2 *special* maps on larger scale. Secondly, 10 Charts drawn from the marine surveys of John Ritchie [17], and thirdly, four *particular* maps of *Bengal and Behar*, reduced from the larger maps to a scale of 6 inches to a degree, with one *general* map covering the whole, on the scale of 3 inches to a degree.

The provincial maps were accompanied by an index showing the lay-out of the different sheets, the area surveyed by each surveyor, a table of symbols, and notes on construction and compilation, in which Rennell writes;

The original surveys from which these maps are compiled were the work of ten different surveyors [33]. A Map was first constructed on a scale of 5 British Miles to an inch, but being too cumbersome whilst in one piece (it being ten feet by seven), is now copying into 15 parts, each part being on a sheet of large Dutch Paper (40 inches by 26), and containing one, two, or more Provinces, or Sircars, according to their extent.

[1] HMS. 765. 2–11–70. [2] Pīlībhīt in Rohilkhand. [3] B Pr C. 23–10–74. [4] Ramghāt, on the Ganges, 53 L/8. [5] B Pr C 8–12–74. [6] Identity obscure; Shāhābād, 54 M/14, was within Company's provinces to East, whereas this question refers to *West* borders of Oudh. [7] Lāl Dhāng, 29° 58′ N.; 20 m. SE. of Hardwār. [8] Delhi, 28° 40′ N. [9] An officer of the GG.'s personal staff. [10] Commanding the army. [11] BPrC. 19–12–74. [12] IO. Maps I. AC. 13.

The following is a list of the *provincial maps*, which are all on the scale of 5 miles to an inch, except where stated. Each one is signed *J. R. fecit*, with the year, generally 1772 or 1773. Each covers a number of complete administrative areas, marked with coloured boundary ribands. On most of them the meridian borders are divided into one-minute divisions of latitude, with no indication of longitude whatever [151].

I. *North part of Bahar*, containing the Sircars of Tirrut, Hajeepour, Bettyah, and Seran, with part of Sircar Monghir north of the Ganges, as is the whole map [72 B & F]. Surveyed between the years 1767 and 1772 by Richards. [Includes Mocaumpour and Morung on the north, which area is marked "Woods", and shows but little detail].

II. *SW. part of Bahar*, containing the Sircars of Rotas, Shawabad, and part of Bahar to about 3 miles east of Patna. [63 O & P, 72 C & D] [Map beautifully clear, and neatly drawn]. Surveyed by DuGloss, Richards, and Russell, 1767 to 1771. The Ganges, from Patna to Benares, by Huygens.

III. *SE. part of Behar*, making overlap with sheet II, containing part of Sircar Bahar, Curruckpour, Boglypour, Curruckdea, and with the Passes of Rajemal, and part of Ramghur. [72 G, H]. Surveyed between 1766 and 1770 by Richards, DuGloss and Carter.

IV. *Purneah & Rajemal*, with the Peiguunahs of Surore and Maldah. [72 O, P.]. Surveyed 1767 to 1773 by Richards west of Mahananda River, Rennell to east; Mahananda River by Adams; eastern slopes of Rajemal Hills by Huygens, western from report.

V. *Dinagepour & Goragot.* ... [78 B. C.]. Surveyed by Rennell, except road from Malda to Dinagepour surveyed by Richards 1767 to 1771.

VI. *Rangamatty, Rungpour & Coas-Beyhar*, with the adjacent Purganas of Baharbund & Bittrebund, & part of Bootan. [78 F, G.]. Surveyed by Rennell, except for Coos-Beyhar surveyed by Martin [35 n. 6]. 1765 to 1773.

VII. *Sylhet*, & the North part of Dacca. ... [78 L, P.]. Surveyed between 1768 and 1771 by Rennell.

VIII. *Southern part of Dacca*, & low lands of Tiperah, with the Islands in the mouth of the Ganges [79 I, J, M, N.]. Surveyed 1764 to 1773 by Rennell, Ritchie & Richards. Country to west by Martin.

IX. *Chittigong*, divided into Chucklahs. [78 N, O., 84 B. C,]. Surveyed between 1761 and 1772. Sea-coast by Ritchie, Islamabad River by Plaisted, inland parts by Richards. This map required a larger scale to have the particulars expressed with clearness & accuracy.

X. *The Sunderbund Rivers.* The *Baliagot* and the *Sunderbund* sailing passages are distinguished by red and green dotted lines. [79 F, J, G, K.]. Surveyed between 1769 and 1773. The coasts and Sunderbunds by Ritchie; other rivers & creeks by Richards; inland area to west by Martin.

XI. *Kishenagur, Jessore*, Noosnah & Mahmudshi; with part of Dacca & Raujeshy, comprehending the habitable part of country between the arms of the Ganges. [78 A, E, B, F.]. Surveyed between 1769 & 1771, rivers by Rennell & Richards, remainder by Martin.

XII. *Bettoriah*, or North Raujeshy. [78 D, H.]. Surveyed by Rennell 1769 to 1771.

XIII. *Birbhoom & Raujeshy.* [72 P. 78 D, 73 M, 79 A.]. Surveyed between 1769 & 1771, eastern area by Rennell, Ganges by Richards, Cossimbazar River by DuGloss, roads through Rajemal Hills by Huygens, country west of Ajy River, by Carter
[This map shows the meridian line of Calcutta] [180].

XIV. *Midnapour, Burdwan, Hoogly*, Bissumpour, & Pachete. [73 J, N. O.]. Surveyed between 1767 & 1774; North part of Burdwan by Rennell, south part by DuGloss, Carter, Portsmouth, & Call; Midnapour by Carter; sea-coast by Ritchie. [Shows the meridian line of Calcutta, and a second meridian about 2 miles east of Midnapour].

XV. *West part of Midnapour*, with parts of Mayurbunge & Ramgur. [73 I, J.]. Surveyed by Carter, Portsmouth & Call.

The next three maps contain material as late as 1775 and 1777, and must have been submitted later [35].

XVI. *Ramgur, Palamow, Chuta Nagpour*, Toree & Koondah. Scale 12 m. to an inch. [72 D, H. 73 A, E.]. Under survey by Fennell in 1774, not completed till 1777. Filled in largely from observations and remarks of Captain Camac & Lieut. Fennell, who reduced these provinces to subjection [35]. [Shows meridian lines, east from Calcutta, one degree apart].

XVII. *Boglipour, Monghir, and the Jungleterry Districts* with the Passes of Birboom & Rajemal. [Covers the whole of the modern Santal Parganas District]. [72 P, P.]. Includes the surveys of Pringle of 1775.

XVIII. Correction to maps of *Dacca & Bettoriah*, 1775: [78 H, L.] [probably by Rennell].

XIX. Map of *Cossimbazar Island.* [78 D.]. [This may have been surveyed in response to a proposal by the Chief of Cossimbazar, dated 20–12–68, that "A Surveyor be appointed to survey the Island of Cossimbazar...as the most effectual means of shewing how far the Silk investment may be improved."]

XX. Country between Sangral & Ooloobaria, along the right bank of the Hooghly. [79 B.] Scale 2 inches to a mile. Surveyed by Rennell 1770.

XXI. Country 20 miles round the *city of Dacca.* [79 I.] Scale 2 miles to an inch. Surveyed by Rennell 1774.

Very few copies of these valuable maps remained in India, and in 1823 the Surveyor General reported that he held only 7 copies, which he describes as indifferent sketches on a scale of 5 miles to one inch, without an original signature. ... Even if...on a sufficiently large scale for the frequent demands of the public service, they are unworthy of credit from their being totally destitute of any Memoir of construction [239][1].

[1] DDn. 204 (9), 26–11–1823.

Blacker knew nothing of the memoir lying in London [33–4] and his severe indictment of Rennell's work is in a way a measure of the progress of the country during the fifty years that had elapsed; the time had come for complete and accurate maps, on which roads could be traced and boundaries laid down with precision; in Rennell's day the urgent need was for a picture of the country, shewing the general course of the main rivers and the situation of the principal towns; a complete map was required with as little delay as possible and precision was of little or no importance.

Rennell had served his masters well; he had complied with their wishes for economy and speed, and had produced in less than twelve years serviceable maps of an area of over 150,000 square miles, previously unsurveyed [2, 228]. Nearly sixty years later, in discussing their value, Everest pointed out that

the cross routes were not sufficiently numerous to develope the features of the country, nor are the principal towns and villages always inserted, on the contrary several blanks intervene [1],

to which the Directors replied,

The Surveyor General appears to have adverted to the reduced map of Bengal and Bahar on the scale of 12 miles to an inch. ... The Surveyor General is not perhaps aware that we are in possession of the original manuscript surveys of those provinces by that eminent Geographer, on a scale of 5 miles to an inch, and which we intend to insert in the Atlas [229] so soon as we shall be in possession of a sufficient number of points determined by triangulation [2].

In 1911 Mr. F. D. Ascoli, then Director of Land Records in Bengal, examined the collection of Rennell's maps at the India Office, and, with the assistance of Major Hirst [3], had a number of them reproduced and published in 1914 in the form of a *Companion Atlas* [4]. At the same time Hirst published a memoir on the maps, to which Ascoli added a chapter on their legal value. It had been suggested that title to property might be established or upset by appeals to Rennell's maps, but Ascoli pointed out that they were in no sense revenue maps; that they were completed many years before the permanent settlement of 1793, and even before the Company assumed full control of the land revenue in 1773. In some cases, they might provide the only available evidence as to the existence of villages and their relative positions, and the general course of the rivers at the time of survey. Hirst emphasised the fact that the maps had no claim to detailed accuracy [5].

Hirst further published a paper entitled *Notes on the Physical Geography of Bengal, 1764–76*, in which he makes a critical examination of Rennell's maps, journal, and tables of road and river distances.

Of his *particular* maps of Bengal and Bahār Rennell writes,

The accompanying 4 maps are a reduction of the large map to the scale of 6 inches to a degree, the scale precisely fixed by the Court of Directors [247].

As many parts of the Provinces are not yet Surveyed with accuracy, recourse was had to the best intelligence that could be procured for forming maps of those parts. To point out the defective parts from the perfect ones, I have inserted the following list of the tracts of country thus vaguely described & also the authorities on which I proceeded [6]. ...

I have also put off the correcting of the General Map till all the provincial ones are formed, for, as the materials are continually increasing, the Map would still be incompleat. Was it to undergo a change every time when fresh materials appeared, it would furnish full employment for one person. The drawing of the General Maps, including those of the Upper Provinces [7], ought therefore to be the last work.

The series was concluded by one *general* map, scale 3 inches to a degree, reduced from the four *particular* maps. These five maps have all four borders sub-divided to minutes of latitude and longitude, the latter being measured from Calcutta.

The following extracts are taken from Rennell's letters home; to Sir Robert Palk, November 1771,

[1] DDn. 283 (45), 6-3-1832. [2] CD. to India, 16-1-1833 (10). [3] Major F. C. Hirst, then Director of Surveys, Bengal. [4] "*Companion Atlas to those published by Major James Rennell in 1779 & 1781*, containing reprints of existing maps...1914,". Contains 2 Index Maps & 58 plates in 93 sheets. [5] Hirst & Ascoli (2, 3). [6] He here acknowledges work from Polier, Boudier, Law, Showers, and many others. [7] IO. Maps, I. A. C. 13.

The general and particular surveys are to be drawn in about 45 or 50 large folio maps, and will be a very compleat work when finished. Each province is to be drawn in a separate map, and most of these provinces are as big as the County of Norfolk, and some as big as Yorkshire[1].

To his guardian, March 1772,

From this sketch you'll partly guess what a job I have to construct particular maps of each Province on scales of 5 miles to one inch, together with general Maps of the whole Country. I have made a considerable Progress in this Work and shall completely finish it in a twelvemonth now. Should I leave the Country next January, I shall yet leave behind me a complete Sett of Original Maps, but leave the fair copying to another. If I stay another year, the whole work will be compleated. ...The distances are all determined by actual Mensuration, corrected by observations of Latitudes and Longitudes[2] [152].

With his next letter he encloses a little plan done in hurry, and by a young draughtsman, for I only put the finishing hand to it, by writing a few words in it. ...I'll request of you not to lend the Map to anyone, nor suffer any to copy it[3].

Rennell eventually stayed out till the beginning of 1777, spending the last three years making improved copies of his maps; in January 1776, he submitted another set for the Directors;

Bengal & Behar	...	...	10 miles to an inch
Ellahabad, Oude, & the known parts of Agra & Delhi	...	...	10 miles to an inch,
The whole in one general map	...	...	20 miles to an inch.

Some corrections & additions to the map of Bengal, from later surveys; accompanied by an account of the construction of each map[4]

The Directors allowed Rennell's general map to be engraved and published privately, and in February 1776 there was published by Sayer & Bennett of Fleet Street, an engraved *Map of Bengal, Behar etc....from Benares to Silhet*, reproducing his surveys on the scale of 12 miles to an inch, "dedicated to the Court of Directors by Andrew Dury", but without bearing any acknowledgment to Rennell[5].

In the same year there was published a "*Map of the Eastern Parts of Bengal*... drawn chiefly from actual surveys, 1769, Engd. by Wm. Whitchurch, 1776. 24 G. miles to an inch[6]".

Hirst has given a very full account of Rennell's maps and surveys in his memoir entitled *The Surveys of Bengal*, published in 1917, with full particulars of the *Bengal Atlas* and its *Companion Atlas*[7].

BENGAL ATLAS, 1779–81

Soon after Rennell reached England he wrote out to Warren Hastings,

I brought home the Provincial Maps safe; but the Directors demur about engraving them, and yet they are now engraving the Map of the Madras Jaghire [88]. Time, and the conviction of it being a saving scheme, will, I hope, conquer their aversion to parting with a little money now to save a great deal in the end: for either the originals will be totally lost; or the copies will run away with a vast sum every year to renew them[8].

He had however to take the responsibility of engraving them himself [167 n. 2], and explained his design in the following note;

The maps of Bengall & Behar engraved in 1776 having been executed in a careless and inaccurate manner[9], and containing none of the surveys taken since 1772, I have been induced to undertake a new engraving of them; which shall contain all the new surveys. Accordingly in this edition there will appear two entire new maps; one of the Conquered Provinces on the South of Bahar; the other of Jungleterry. There will also be very great additions made to Purneah, Coos Beyhar, Midnapour, Burdwan, Gentiah[10], and the Sunderbunds.

[1] *Palk MSS.* 12–11–71. [2] HMS. 765, 15–3–72. [3] ib. 6–4–72. [4] These scales are in terms of *geographical* miles, so correspond to those of the earlier maps, 6 and 3 inches to a degree. BPC. 5–2–76. [5] MRO. Map 445. [6] Seton Kerr IV (pocket). [7] Where these records do not agree with Hirst, careful consideration has been given to fresh evidence. [8] BM. Addl. MSS. 29140 (343), 1–5–78. [9] Probably by Whitchurch or Dury [*sup*]. [10] Jaintia, 83 C.

As these maps are chiefly designed for the use of the gentlemen who travel in Bengall & Bahar, the Survey of these Provinces is divided into 8 parts, which will fold very conveniently into a quarto Book, and take but little room either in a Palankeen or escritoire.

The divisions are as foilows :—

1 to 8. Eight parts [*inf.*] Scale 10 miles to an inch.
9, 10. Two General maps. Scale 20 miles to an inch.
11. The Dooab, on same scale as Bengal, ... a new Map.
12. The Cossimbazar Island. Scale 5 miles to an inch.

In the re-distribution of the 8 parts of Bengal, more regard has been paid to the natural than to the political division of the country; yet as far as it could be done the Provinces or Sircars are preserved entire.

The above 12 maps (in Boards) will be afforded for about a guinea and a half. A good binding 7s 6d more[1].

He sent a copy of this note to Warren Hastings with a letter dated November 20th 1778;

I have also begun a new set of maps of Bengal & Bahar, the nature of which will be explained by the enclosed Paper; and no less by a first proof of one of the maps. I do not expect to get them finished till next April or May; so that the sets will hardly find their way to Bengal that year. I shall take care however to send you one of the first copies that is worked off[2].

The first edition of the Atlas duly appeared on November 1779, engraved by W. Harrison, of 42 Wych Street, London, and entitled,

A Map of Bengal and Bahar in VIII parts, with an index map to the VIII divisions of Bengal & Bahar. Published according to Act of Parliament by J. Rennell, November 21st 1779[3].

The nine plates were as under, the scale of the first eight being 10 geographical miles to an inch.

I. *Map of the Delta of the Ganges*, with the adjacent countries on the East, and a plan of Samookgur.
II. *The Jungleterry District and adjacent Provinces of Birmbhoom, Rajemal, and Boglipour*, comprehending the countries between Moorshedabad and Bahar.
III. *Map of South Bahar.*
IV. *Map of North Bahar.*
V. *The Northern Provinces of Bengal*, with the Bootan, Morung, and Assam Frontiers.
VI. *The Low Lands beyond the Ganges*, from the Mauldah River to Silhet.
VII. *The Provinces of Bengal lying on the West of the Hooghly River* with the Mahratta Frontier.
VIII. *The Conquered Provinces on the South of Bahar*, viz., Ramghur, Palamow, & Chuta-Nagpour, with their dependencies.
IX. *Map of Bengal & Bahar*, comprehending a Tract more extensive & Populous than the British Islands.

Respectfully inscribed to Warren Hastings, in Testimony of his distinguished Abilities, and in gratitude for favours received.

A Table of areas totalling 149,217 square miles, contrasts Bengal with Great Britain and Ireland, of area 121,800 square miles [226].

This plate is on the scale of 25 miles to an inch, and covers the area of the VIII maps above.

In 1778 the Directors had agreed to advance £150 towards the engraving of this Atlas, "the charges of executing which work will be defrayed by a subscription of the Company's servants in India"[4]. This advance was to be repaid in 18 months without interest, and in 1779 a further advance of £100 was made on the same terms.

Free transport was allowed for a consignment of the atlases to Bengal, which were to be issued to Company's servants at Rs. 16 for a folio atlas, and Rs. 14 for quarto; 80 copies folio and 120 quarto were sent out before July 1780[5].

A second edition followed in 1780, containing 13 plates, and was entitled

A Bengal Atlas: containing maps of the Theatre of War and Commerce on that side of Hindoostan. Compiled from the Original Surveys; and published by Order of the Honourable Court of Directors[6].

Early in 1781 a quarto edition was published[7] with 23 folded maps, in the advertisement to which Rennell wrote,

The intent of publishing the maps of Bengal...under the present Form, was to render them portable to those who travel over that extensive country[8].

[1] BM. Addl. MSS. 29210 (298). [2] ib. 29142 (75). [3] *IO. Cat.* (164). [4] CM. 1–10–78. [5] CM. 10–5–80, & CD to B. 5–7–80 (40). [6] Scale of first 8 sheets now given as 12 *British* miles to an inch. [7] *IO. Cat.* (165) also Hirst & Ascoli 35. [8] *Ben P. & P.* Dec. 1935 (69).

Two more editions followed in 1781, of folio size, with the maps unfolded, and a final edition was issued in 1783. The later plates were,

X. *General Map of Oude & Allahabad*, with part of Agra & Delhi. Scale about 25 miles to an inch. [Longitude east of Greenwich is given along the north edge and west of Calcutta along the south edge; Calcutta being taken as 88° 25′ east of Greenwich.] [153, 180]

XI. *Map of the Cossimbuzar Island.* Scale 5 miles to an inch. With a sketch of the Battle of Plassey, on scale 1,500 yards to an inch.

XII. *Plan of the Environs of the City of Dacca*, (or Jehangurnagur) Scale about 2 miles to an inch.

XIII. *The Doo-ab*, from Allahabad to Kalpy. Scale 6 miles to an inch.
Plates XIV to XVII, scale 5 miles to an inch, show *the Ganges* from Allahabad to its confluence with the Megna, and the Megna hence to the Luckia River [19, 21].
[These plates are specially well drawn, with tree symbols and excellent lettering].

XVIII. *The Burrampooter* from the head of the Luckia or Banner River to Assam. Scale 5 miles to an inch. Inset, A Southern View of Dellamcottah Fort [pl. 5] in Bootan, inscribed to the memory of...John Jones, ...and Plan of Dellamcotta Fort, by Captain Claude Martin.

XIX. *The Hoogly River from Nuddeah to the sea.* Pub. August 25th 1780. Scale 5 miles to 1 inch. *Balasore Roads & Point Palmiras.* Scale 3¼ marine leagues to 1 inch.
Battle of Oudanulla[1]; Maj. Adams. Aug. 1763. Scale about 3 miles to 1 inch. [About 3 miles below Rājmahāl].

XX. *A Map of the Sunderbund & Balliagot Passages.* Scale 5 miles to 1 inch. Includes Calcutta and Culna on the north, Sutalury on N.E., and Backergunge.

XXI. Views of *Oudanulla* (1763) & *Chunar Gur* (1764): by Claude Martin.
Semi-final Plate illustrates the action of the Ganges waters in erosion of Banks and formation of Islands.
Final Plate is a map of Inland Navigation [230].

The enlarged Atlas sold at Rs. 22 for a folio volume, and Rs. 20 for a quarto, and Rennell was allowed to send a box by each ship proceeding to Bengal[2]; he wrote to Warren Hastings,

All the Bengal Atlases sent out by the last Fleet were carried to Spain. I have now added very considerably to the work. I have prepared 400 copies of it, to go by the ships of the present season. ... If the demand should increase I may possibly reap some advantage from the publication. From the locality of the subject and its consequent limited sale, I was obliged to fix a high price on it[3].

Two years later the Bengal Government reported,

In consequence of the orders contained in your letter of the 8th of Feb. 1781 regarding the sale of a number of Major Rennell's Bengal Atlases which you sent to us by the ships of that season, we beg leave to inform you that they have all been disposed of accordingly, and the produce of the sales amounting to Rs. 9590–14–0 deposited in your treasury[4].

In 1785 the Atlases were advertised

to be sold at the Council House Calcutta for Ready Money, Those in folio @ 30 Sicca Rs. each. Those in Quarto @ 25 Sicca Rs. each[5].

The atlas now had a wide circulation amongst officials throughout the Provinces, and it is interesting to find the Board of Revenue sending this very practical advice to the Resident at Tipperah in 1789,

A topographical knowledge of the Districts in his charge is absolutely necessary for a Collector, but Rennell's maps will be of little service to him in that respect. He must make the Tour of his district himself[6].

In 1823 the Surveyor General reported that

the great utility of the Bengal Atlas published by Major Rennell many years ago (but which excellent work is now I believe out of print) has been generally acknowledged[7].

A partial reprint made in 1826 was advertised thus,

In the Press, Calcutta; Rennell's Illustration of the Rivers Hoogly and Ganges, from the mouth of the Hoogly to Cawnpore, comprised in 9 doubles plates, 4to. coloured, to which are added Tables of Routes and Distances from Calcutta, thoughout all the principal Inland Navigation, Price in Boards; Sa. Rs. 10[8].

Rennell's atlas remained the standard map of Bengal until 1850 or thereabouts, when the ¼-inch sheets of the new *Atlas of India* began to appear. These contained much of Rennell's original survey from his 5-mile provincial maps, fitted to later surveys and the triangles of the Great Trigonometrical Survey [226].

In 1908 the *Bengal Atlas* received new lease of life. A new design was being worked out for Indian maps and, inspiration being found from a study of Rennell's

[1] Undwah Nala; 5–9–63. [2] CM. 11–1–81, & CD. to B 8–2–81 (24). [3] BM. Addl. MSS. 29147, 26–1–81. [4] B to CD. 1783 (38). [5] *CG.* 24–3–85. [6] B. Rev. B. 4–6–89 (27). [7] BMC. 7–11–1823. [8] *As J.* March 1826.

old plates, it was decided to make a complete reprint of the 1781 edition[1]. This was done in 1911 and the plates are now stocked for sale at Calcutta, and replenished as a matter of routine to meet a steady demand.

DISTANCE TABLES

In 1776 Rennell submitted, with his general maps, a Road Table entitled *Great Roads of Bengal & Behar*, with Dacca taken as centre; this was supplemented by tables showing roads and distances to places of note from other central cities. In 1778 he published a pamphlet entitled *Description of the Roads in Bengal*, of which he writes to Warren Hastings,

Since I have had any leisure from my own private concerns, I have chiefly employed myself in superintending the printing of a Book of Roads of Bengal. I trust it will prove extremely interesting[2].

In the preface he describes it as,

A complete travelling guide, as far as relates to distances and the nature of the rivers that intersect the roads. The utility of such a work in *any* country must strike every one: much more in a country where the people employed by Government are mere sojourners, and from the want of local knowledge must depend upon the information of Guides, who often mislead them either through ignorance or interested motives [89, 95, 241]. At best these guides know only the most frequented roads; so that in crossing the country no information whatever can be derived from them: and as for the peasantry, or *ryots*, they cannot be supposed to know the roads beyond the circle of the markets which they frequent. ...

By comparing the distances in the Tables with the horizontal distances in the Map, it will be found that one mile in seven is taken up by the windings of the Roads; which, considering the flatness and openness of the country, is a circumstance that one would not expect [184–5].

As most parts of Bengal & Bahar are level, or nearly so, the Sun's rising and setting may, in clear weather, be as easily discerned as at sea; I have therefore added a Table of the time of the Sun's rising and setting, as it furnishes the easiest method of regulating time for common purposes[3].

In 1781 he published a *Table of Routes and distances from Calcutta through the Principal Inland Navigations*, with similar tables from Dacca, Murshidābād, and Patna; it also included a statement of areas for the main subdivisions of Bengal, and a *Map of Inland Navigation*, which distinguished rivers perennially navigable from those open for part of the year only[4].

In 1779 Call prepared a *Map of the Principal Roads of Bengal, Behar, Oude &c*[5] [235], and in 1794 Colebrooke submitted distance tables for the Upper Provinces and Oude;

The accompanying Table of the Distances from Benares and Lucknow to most of the principal places in the Upper Provinces; but having been informed from maps, these distances will be found to fall short of the real travelling distances by a few miles, though seldom more, I hope, than in the proportion of five miles to a hundred.

I have only inserted the distances by water of places situated on the Ganges; the other rivers falling into the great river above Patna being seldom navigated...by any...civil or military servants. ...

I shall now proceed to lay down in the manner of Major Rennell a set of Tables of the Roads throughout the Upper Provinces, but this must necessarily be a work of time[6].

In sending these tables home Government remarked,

A copy of this table has been sent to the Civil Auditor for his guidance in auditing Bills for Travelling charges, as far as it can direct him for the purpose, in addition to the Table which was prepared by Major Rennell[7].

[1] At the suggestion of Capt. W. M. Coldstream. [2] BM. Addl. MSS. 29142 (75), 20–11–78. [3] *Roads in Bengal*; Chittagong to Benares: a free issue to all military officers, CD to B. 23–12–78 (204). [4] Pamphlet. IO. Maps. II, AC. (4, 5); Map, also in *Memoir & Ben. Atlas*. See also Hirst. [5] BMC. 17–7–1813 (75–6). [6] DDn. (1667), 5–1–95. [7] B to CD. 5–2–95 (69).

DISTRICT MAPS

Rennell's 5-mile Provincial Plans were not at first available for use in the districts, for apparently he had only left one copy of each in India. In 1776 the Governor General wrote,

I have had frequent representations from the provincial Councils of the difficulties to which they are liable for the want of provincial maps, and having been lately furnished with a very compleat general map of the province by the Surveyor General, drawn out upon a scale so large as to comprise all the principal Towns and Places of every district, which I judge will be more useful as a reference for this Board than the separate maps of each division, I recommend that this map which I now lay before the Board may be deposited in this office for their occasional inspection, and that the maps of the Provincial Divisions may be transmitted to several Councils & Collectors [1].

This was agreed to and acted upon, but ten years later, on the Surveyor General's report that many of these plans were missing from his office, Government wrote to all districts calling in any that might still be found. This met with but little success, for most officers reported that they had no map of their district whatever, whilst the few who did possess one urged the impossibility of giving it up [257–8].

In 1792 the Chief Engineer, Wood, whilst in temporary charge of the Surveyor General's office, raised the question again, reporting that there were two draughtsmen

making copies of several of the Provincial Plans which had been found in a very tattered state. ... I have since had an opportunity of examining and of arranging those Plans, which are ten in number. ... These Plans are on the large scale of 5 miles to an inch, and I think it is most probable that there must have been formerly Plans of the whole country on the same scale for the use of the Collectors and Revenue Servants; but which in the Course of so many years have been lost or mislaid.

There were yet 15 districts for which no plan had been found;

Should any of the Plans be irrecoverable lost, I will have others on the same scale immediately constructed. ... The inconveniences arising from the want of those Plans is frequently experienced, having lately had an application from Mr. Macguire of Tipperah for a plan of his district, which could not be complied with [2].

The following year the Chief Engineer submitted

13 Plans on a large scale of the different Collectorships. ...There is scarcely a Collector throughout the whole of the Company's possessions who have any sort of Plans of their respective districts, and without them they must be kept greatly in the dark [3].

The Collector of Burdwān asked for a map of his district showing *parganas*;

A Map of this kind is the more wanted, in consequence of the proposed sale of a large portion of the Burdwan Zemindary in numerous lots; ...It might be found an assistance to the Magistrate, by enabling him to distinguish the relative positions and distances of his Police Tannahs, and certainly to the Collector in his business of regulating & realizing the tax proposed for the maintenance of those Tannahs [4].

In 1796 the Surveyor General reported, in reply to a request for a map of Dacca District, that

we have not in the office any complete Map of the District of Dacca on a large scale, the only documents of that Part of the Country which remain being of a very old date, and much decayed, nor could I have them copied so as to form a connected Draught of the whole, as a part of one of the sheets is missing.

As the Honble. Court of Directors are in possession of all the original surveys which have been made of these Provinces, and as no new surveys of any consequence have been taken of late years, I would recommend that they be written to on this subject, to request that they would be pleased to authorise the Engraving and publishing a set of Provincial Maps on a scale not less than five British Miles to an inch [5].

This very reasonable suggestion was not approved, and a great opportunity of of helping the work of district officers was thrown away.

[1] BRC. 1–5–76. [2] BPC. 22–2–92 (17). [3] BMC. 15–2–93 (19). [4] MRIO. M 574, 17–6–93. [5] BMC. 26–9–96 (35).

UPPER PROVINCES, 1797–1800

As the affairs of the Company became more concerned with the Upper Provinces, the more inadequate were Rennell's maps found to be, and in 1797 the Surveyor General wrote to Wilford at Benares;

As the recent invasion of the Punjab by Zamaun Shaw was the cause of serious alarm to our Government, and his long-intended inroad into Hindostan may at some future period be carried into effect [57], I conceive it the duty of my office to collect in the time, for their use, every possible information relating to the countries through which the invader might be expected to approach. ... I have therefore to request that you will assist my endeavours...by sending down to the office every original route or document in your possession. ... What would be more particularly useful at present are the original sheets of the great general map, which was compiled by you and the late Col. Call; ...I cannot much depend upon the copies which we have in the office, as in consulting them occasionally I have discovered numerous errors. ...

I have in hand of my own a map of the Doab, and Rohilcund, which is in tolerable forwardness, compiled from the surveys of Messrs Rind, Hunter, Mouat, & corrected by Reuben Burrow's astronomical observations[1] [163-4].

In 1800 he was able

to lay before the most Noble the Governor General in Council, the accompanying Map of the Dominions of Oude &c. which has been compiled chiefly from the Materials in this Office.

The Latitudes and Longitudes of many of the Principal Places along the Ganges, and in Rohilcund, have been laid down from the observations of the late Mr. Reuben Burrow, but, since this Map began to be constructed, some other plans have been procured, which with the Survey that is now making by Captain Thomas Wood...will enable me...to lay before Government a copy still more accurate and complete[2].

PUNJAB & AFGHĀNISTĀN

The Punjab was probably better known to early geographers than any other part of India owing to the campaigns of Alexander the Great and the interest roused by his historians [207]. The following extracts from D'Anville indicate the confused nature of his later information; he would indeed have rejoiced at a sight of Monserrate's map and *Commentarius* [pl. 10].

For the situation of most places between Kandahar and the Indus, I am indebted partly to the Turkish Geographer, compiled by Kiatib-shelebi, under the title of Gehan-numa (The Mirror of the World) and partly to the historical account of the expedition of Timur. ...

The Tchenav, which joins the Indus near Attek[3], is the river which comes from the district of Kashmir: For this we must depend upon two modern travellers, Bernier[4] and Thevenot [118 n. 3]. ... Kashmir is celebrated by the Eastern nations; ... The mountains which surround and defend it on all sides represent a kind of shell, from which issue a multitude of streams, which unite in a river a little above Sri-nagar, the capital of the country, and in order to get out...the river opens a passage between the mountains, just wide enough for it to run through, and which are called the Baramule[5]. The Eastern Tables make the latitude of Kashmir 35°, but I cannot think it so much: that of Lahaur is fixed at 31° 50′[6] [148]. ...

Bernier...has given a map, of which our geographers seem to be unacquainted, in which this part of India, in general, has been carefully attended to. ...

Tchenav is the first of the five rivers, which occasioned the Persian name of Pendj-ab, ... Shantov comes next, after which we find Ravee, which is the river of Lahaour; then Bish, and last of all Caul[7]. ...

Alexander having crossed the Indus, came to Taxila[8], the largest town between the Indus and the Hydaspes[9]: I am inclined to think that this is the same with Attek...which at the conflux of the Tchenav and the Indus, may be situate on the left hand, or farther bank of these rivers[10].

[1] DDn. 16 (25), 23–3–97. [2] Map, scale 8 m. to an inch, 1798, MRIO. 28 (6); and another, in 7 sheets, scale 4 m. to 1 inch, 1800, MRIO. 15 (22-7). BMC (59), 3–7–1800. [3] Chenab joins Indus, 39 K/12, 350 m. below Attock. [4] Dr. Bernier visited Kashmir with Aurangzeb, 1664. [5] Baramula, 43 J/8; an excellent picture of Kashmir Valley, except that its river is the Jhelum and not the Chenab. [6] Srinagar, 34° 6′ N.; Lahore, 31° 36′ N. [7] The five rivers, from W. to E, are Jhelum, Chenāb, Rāvi, Beās, Sutlej. [8] 43 C/14. [9] Identified by Rennell as Jhelum R. [10] Herbert (10–16).

Herbert includes a map entitled *Carte du Pais traversé par le Fleuve Indus*, taken from D'Anville's map of Central Asia, which illustrates the above account.

Rennell's geography in 1782 was not much further advanced, but by 1792 he had collected fresh information from which he prepared a new map covering *the Countries situated between Delhi and Candahar* [pl. 8] ;

By the favour of my friend Col. Polier, I am possessed of a map of the countries situated between the upper part of the course of the Ganges, and the rivers of Punjab : and between the northern hills and the road leading from Delhi to Batnir[1]. This map was constructed by an European gentleman, whose name I an unacquainted with : but Col. Polier assures me that the routes between Delhi and Sirhind were drawn from the gentleman's own observations on the spot[2].

For the country between Delhi and Ajmer he acknowledges a map by Father Wendel [12] and for the Punjab rivers,

I have derived considerable assistance from the Persian MS. map of the Punjab[3]; ...it was drawn by a native, and preserved in the archives of government in Hindoostan. The names were obligingly translated from the Persian by the late Major Davy [249]. ... The tract includes the whole soubah of Lahore and a great part of Multan proper. It not only conveys a distinct general idea of the courses and names of the five rivers ; but with the aid of Capt. Kirkpatrick's MSS. [42] sets us right as to the identity of the rivers crossed by Alexander[4]. ...

By the help of the Persian and other MS maps, particularly a map of the Punjab...drawn by Lieut. Rind , ...I have been enabled to give the road from Wizierabad[5]...through the Retchna Doabah, with many other positions in and about the Punjab[6].

Rind's *Map of the Country of the Seiks* [42], gives a crude representation of the five rivers, with a few place names, and a suggestion of the foothills ; its most interesting feature is the naming of the four *doabs*, *Sind Sagur*, *Retchena*, *Bary*, and *Baeit Jalinder*. It was in great demand and several copies now exist in Calcutta[7]. Rennell continues,

The Behut[8], or Cashmere river, was supposed by M. D'Anville...to join the Sinde[9] at Attok. Tavernier seems to have led M. D'Anville into this mistake ; which has finally been the occasion of his misplacing, and of course misnaming, all the other four rivers. The fact is that the river which runs by Cabul, and in the lower part of its course, bears the name of Attock, joins the Sinde on the West side, and in front of the city of Attock. We are obliged to Mr. George Forster...for clearing up the mistake ; and finally to the very particular and pointed observations of Capt. Kirkpatrick, for illustrating the courses of the rivers in general, in this quarter[10].

Forster had made a remarkable journey through the lower Himālaya, Kashmir, Afghānistān, Persia, and Russia. Starting from Benares in August 1782,

It was necessary, from a regard to safety, to avoid the country of the Seiks ; that is, Lahore : he accordingly crossed the Ganges and Jumnah within the mountains, and proceeded to Kashmere by the road of Jammoo[11]. From thence, crossing the Indus about 20 miles above Attock, he proceeded to Cabul. ...

As he travelled in the disguise of an Asiatic, and in the company of Asiatics, through a vast extent of Mohammedan country, where the religious prejudices...are nearly equalled by their political jealousy of all sorts of foreigners, ...detection had been worse than death. ... From the time he left the last British station in Oude, to the Caspian, ...he employed near a twelvemonth, and travelled 2700 English miles, ...sleeping in the open air, even in rainy and snowy weather ; and contenting himself with the ordinary food and cookery of the country he passed through[12].

He reached St. Petersburg in 1784, and in 1790 published an account of his journey[13] with a

chart of the road, calculated according to the reckoning of my journal, ...constructed by Mr. Wilford, ...a gentleman of extensive geographical knowledge[14].

Rennell concludes his remarks,

The geography of the Punjab country...I have detailed much beyond its seeming importance ; ...we are not likely, as for as I can judge, for a great length of time, to be possessed of

[1] Bhatinda, 44 J/16. [2] Sirhind, 53 B/6. *Memoir*, 1793, (67). [3] Possibly MRIO. 97 (10, 11). [4] *Memoir* 1793 (103). [5] Wazirābād, 43 L/3. [6] *Memoir* 1793 (110–1). [7] MRIO. 4 (525), 12 (30 etc). [8] Jhelum R. [9] Indus R. [10] *Memoir*, 1793 (100). [11] Through Nāhan, 53 F/6 ; Bilāspur, 53 A/15 ; Jammu, 43 L/14 ; Srinagar, 43 J/16. [12] *Memoir*, 1793 (148–9). [13] Adv. *CG*. 11–3–90, " Price Rs. 25. Embellished with a Correct map explanatory of the route ". *As AR*. I (86). [14] Forster (xiii).

any better materials than those I have exhibited, indifferent as they may be in many instances; and therefore I consider it as the finishing stroke to the whole matter for some time to come[1].

He was wrong in thinking that his map would long remain the "last word", for in 1804 Wilford completed *A map of the Countries to the West of Delhi, as far as Cabul and Multan*, scale 16 m. to an inch[2], which carries the following note;

The survey of these countries was undertaken about 20 years ago by Capt. Wilford, in order to ascertain the track of Alexander. It was completed between the years 1786 and 1796 by a native properly instructed [287].

This native surveyor, with safety to himself, could only use a pocket compass: the distances of course are computed. ... The survey is checked towards the S.E. by the known latitudes and longitudes of Hardwar, Delhi, Jypore and Ajmere, but thro' this extensive country we have to lament the total want of actual surveys & accurate observations of Latitudes and Longitudes. There is however a measured track from Delhi to Cabul, and another from Lahore to Moultan, by order of the Emperor Shahjehan[3]. ...

In 2 instances this map differs materially from that lately published by Major Rennell; Distance from Delhi to Lahore and again from Lahore to Moultan; Delhi to Lahore, Rennell, 280 geo. miles; Wilford 222. Capt. Wilford having leisurely and maturely investigated this subject for several years past is convinced that his distances are correct[4].

Wilford's map was a very great advance over Rennell's geography, and on the whole his detail was remarkably good. He showed the Indus down to Sukkur, and all the Punjab rivers; the distant regions of Dera Ismail Khān, Kohāt, the *Coorum* River; Jalalābād and Kābul; *Dheer*, *Chatraul*, and *Tereejmeer*, to the north; the "*Tor Caffirs* called also *Syapoosh* or Black Vests, Black Infidels", and the "*Esphin Caffirs*, White Infidels"; *Gilghit* and *Hunze*.

He places Gilgit about 72° 52′ E., 35° 58′ N. as against the true position of 74° 20′ E., 35° 54′ N., and shows the general course of the Upper Indus correctly. There are of course minor errors and a general wildness in longitudes values; but the map is a wonderful example of what could be done by compilation from trustworthy information.

Wilford had long established himself as a learned geographer, and Burrow in 1788-9 preferred to send his geographical information to Wilford rather than to the Surveyor General;

I forgot to mention the reasons why I have not sent copies of the routes among the Comow [161 n. 3] Hills; in the first place they are out of the limits of Major Rennell's Bengal Atlas; secondly they require more time to translate and explain them than I can spare at present; thirdly, as Mr. Wilford has been for a long time collecting materials at his own expence for making a Map of the external parts bordering on India, they will be of more service to him, and ultimately to the Company, than they can possibly be by sending them home[5].

Reynolds' native surveyors added much to the knowledge of the Punjab, Rajputana, and Sind [132], and most of their work is included in the maps shown on p. 246.

MAP DRAWING AND DRAUGHTSMEN

Both Rennell and De Gloss took three or four European assistants with them when they set out on survey [283], and it is reasonable to presume that these assistants made themselves useful in map drawing. Rennell must have spent quite as much time in plotting his surveys and in compiling and drawing his maps as he did on actual survey; and he mentions that Richards assisted him.

In his establishment returns of 1768 he allowed for a draughtsman with pay at Rs. 120 a month, whilst a surveyor of the rank of captain was allowed one "at Rs. 60 a month and Rs. 1 a day when on actual service", and a subaltern was "allowed no Draughtsman, except by particular orders[6]".

[1] *Memoir*, 1793 (111). [2] MRIO. 7 (11). [3] Wilford here acknowledges astr. obsns. of Monserrate [149]. [4] True distance; direct, 240 G. miles; by road, 291 m. or 250 G. m. [5] IO. Maps. MS. 5. [6] BPC. 30-6-68 & 4-7-68.

Rennell made his headquarters at Dacca, and from about 1772 till his departure in 1777, must have been almost continuously employed in map drawing, with a fairly efficient staff of draughtsmen; he refers to "a young draughtsman" in a letter of 1772, and the name J. Fougeron is associated with his own on a map dated 1775[1].

In 1779, when the pay of the Surveyor General came under revision, Call pressed the importance of an adequate allowance for map drawing;

I am led to believe your Hon'ble Board have either overlooked the necessary allowance for Draughtsmen, or that it is your intention I should draw for them in a separate Bill monthly as a contingent expence not to be ascertained. To put my Office on a good footing, ... permit me to lay before you a particular account of the necessary Draughtsmen for my Office.

Two European Draughtsmen ...	@	350 ...	Rs.	700	
Four Native ,, ...		60 ...	Rs.	240	
Three Portuguese ,, ...		150 ...	Rs.	450	1,390

Part of the business in my Office requires men of Genius and ability to execute; it requires precision, close attention, and much application; few such Draughtsmen are to be met with in this Country, and they will exact their own rewards. I have absolutely engaged two European Draughtsmen possessed of the necessary Qualifications, and I wish to give them proper encouragement. ...

For six months past I have been closely engaged in framing a new General Map of India, making fair copies of it; Copying Plans furnished me by the Governor General & Commander in Chief; Maps of Roads, &c. &c. [230]; Reducing Routes of the Army, and inserting them in my general Map. I have absolutely been unable for want of necessary assistance to reduce the Surveys of the Several Gentlemen employed in that Branch, and I have now several months work to bring up[2].

The Surveyor General was then allowed to make a fixed charge "upon honour" to cover all the expenses of his office, including draughtsmen [262], but under the retrenchments of 1785 this arrangement was withdrawn, and he made the following estimate for completing the copies required by the Directors [252];

To give you as exact an estimate as possible of the expence in making copies of such a variety of Maps, Charts, Plans, Journals, &c. as I have in my possession, I am of opinion that the following people will necessarily be employed about 12 months,

4 European Draughtsmen ...	@	350 a month	Rs.	1400	
3 Portuguese ,, ...		150 ...	Rs.	450	
4 Bengal or Portuguese Writers		60 ...	Rs.	240	2090

Good European or Native Draughtsmen are with difficulty procured, and they must be handsomely rewarded, or they will not work[3].

The Board refused to accept this estimate, and Call replied,

As your Hon'ble Board have since been pleased to withdraw my allowance for Draughtsmen, Writers, Stationery, Office Rent, and every contingent allowance, it will be impossible for me to comply with the orders of the Hon'ble the Court of Directors[4], ...

whereon Government "allowed him Rs. 4000 to compleat the rough draught of his large map", and on his further representation that,

If the Original Plans...sent to my office are to be copied and sent home, it will require draftsmen and writers at the rate of Rs. 700 a month for 12 months, and it will be necessary either that Rooms be allotted to the Draughtsmen to work in, or an allowance of Rs. 250 a month to be made for that purpose[5];

this estimate was sanctioned for 12 months, besides the Rs. 250 for Wilford as Assistant in the Drawing-office [277]. For the future it was provided that,

All plans executed by the Surveyor General or under his instruction should be paid for, either by contract or estimate, previously approved of by the Board. ... Paper and other materials for drawing to be drawn for by bill, as actually purchased, and audited by the Board before payment [205],

and further that a statement of the work actually carried out should be submitted with every claim for pay of draughtsmen. It was not long before Wood, who had succeeded as Surveyor General, protested against these restrictions;

[1] MRIO. 53 (7). [2] HMS. 358 (45), 12–8–79. [3] BPC. 9–9–85 (7). [4] BPC. 31–8–85. [5] BPC. 15–9–85.

When the Board came to the resolution that the Surveyor General should send in the monthly bills, ... accompanied by the work finished during every month, ... I stated that Draughtsmen and such people as were employed by the Surveyor General were not like common writers, who could be discharged or increased occasionally as circumstances might require, but that they were artists difficult to be procured, more particularly in this country, where there is no regular establishment for the education of people in this science.

For this reason I requested that in place of sending in monthly bills with work, ... a small establishment should be allowed, similar to that of the former Surveyor General, and that when any extraordinary work might render any increase necessary, application for this purpose should be made to the Hon'ble Board. ...

For the common services of the Surveyor General's Office, an establishment of Draftsmen and people a fourth less than what was drawn for by the former Surveyor General will be sufficient[1].

By the following year, Wood found the pressure of work in the drawing office so great that he proposed the introduction of two Engineer officers to assist;

The difficulty in procuring Capable Draftsmen amongst our own Countrymen and the necessity of employing Foreigners on business requiring confidence and fidelity, has long been a matter of regret [245]. ... There are several Young Gentlemen whose abilities as Draftsmen, altho' not such as would make them immediately useful in this line, yet after the practice and experience of a few years, I have no doubt but that they would be capable of executing any work entrusted to their care.

I beg leave to recommend that I be authorized to employ two Young Gentlemen...at a Monthly salary of 150 Rupees each; Specimens of their abilities being previously submitted for your Lordship's approbation[2].

Two officers, Anburey and Stewart[3], were appointed, and at the same time orders were issued restricting the monthly charge for other draftsmen to Rs. 600. In 1788 the Surveyor General reported that the draftsmen actually employed were,

Andrew Hemmanneau. Employed by me for these 6 years past, originally at Rs. 600 per month, to work 5 hours in the day, every day but Sunday; but for these two years past paid according to his work and abilities.

Jean Boisseau[4]. Employed by Colonel Call and myself for these last 4 years, originally at Rs. 120 a month, for 5 hours a day, but for the last two years paid according to his work.

T. Wood Junr[5]. Employed since July 1786: at present absent [245].

Ramnarry, a Bengali Draftsman, employed occasionally in common work @ Rs. 60 per month.

When it was customary to pay the Draftsmen per month for their 5 hours attendance, little or no work could be executed; as, what under the excuse of sickness and other pretences, bad attendance was given, & even when present, little work done; the tasking them, or allowing them so many days or months for a certain work, was therefore successfully adopted by my predecessor, and followed by me[6].

In 1789 Government reported that they had extended the period of employment of the two Engineer officers;

We understood likewise that he [Surveyor General] was compelled then, and had been for some time back, to have recourse to foreigners as being the most capable men he could select in the Settlement. As the ties which could be maintained upon the fidelity of these Men were very weak, We yielded to the propriety of the Surveyor General's recommendation, authorizing him to employ two young men for the space of 12 months, ... since continued or another year[7].

In 1788 the Directors once more insisted that copies of all surveys should be sent to England to be mapped there rather than in India [252]; they scoffed at the Surveyor General's plea of the great labour and expence;

We cannot agree with your Surveyor General that these copies would necessarily be attended with great expence, and require much time to copy; for copying maps and plans on transparent paper is a work easily and speedily performed by a careful person, without almost any knowledge of drawing. We do not mean to depreciate Elegance in execution of Drawings; but *actual information* must supercede every consideration of *Decoration* [245]. ...

Every new acquisition must be transmitted by the earliest opportunity; for the facility of making copies we now send you half a Ream of paper; we need not observe to you that

[1] BMC. 24–11–86 (21, 22). [2] BMC. 9–3–87. [3] Stewart's resignation accepted. BMC. 24–3–89.
[4] Half-brother to Hemmanneau. [5] Thomas Wood, younger brother to Mark; joined Mad. Engrs. 1788.
[6] HMS. 369 (122); B. S & Sep. 12–6–88. [7] B to CD. (S & Sep) 8–1–89 (150).

as it becomes opake in the warm climates, it ought not to be exposed to the air, and that the Chart...should be traced in black lead pencil, and afterwards done in ink, correcting any defect in the outline; we are informed that the ink proper for the purpose is China Ink, or any Ground Ink, not too fluid[1].

They approved that the Surveyor General should be given a special assistant for charge of the maps and drawing office [258], Wilford having now gone to survey to Benares, and suggested Colebrooke who joined in July 1789 [258 n.7].

At the end of 1790 the Surveyor General, Alexander Kyd, and Colebrooke were ordered off to the war in Mysore, and Anburey followed the next year; all the draughtsmen except Hemmonneau and Boisseau accompanied the Surveyor General, and the office and maps were left under the charge of Wood, now Chief Engineer. The quantity of maps to be copied hardly eased during this interval, and by the time that Colebrooke took charge of the office in 1793, the volume of fresh material had been vastly increased. There were still questions about the bills;

I beg the favour of you to represent that no fixed allowance is settled by the Regulations for Stationery and Drawing Materials; I...should consider for the future an Allowance of from forty to fifty Rupees per month as amply sufficient to defray every Charge for antiquarian and elephant paper; Reeve's colours; Indian Ink, Pencils, and other articles[2].

Government ordered that bills for actual expenditure should be submitted to the Auditor General and that annual returns should be made reporting the actual work carried out.

Drawing paper was often a difficulty; and to facilitate the copying of maps for England, the Directors sent out supplies of tracing paper [252] of which Wood writes contemptuously;

As for Oil Paper, in future it had better be kept at home, being totally unfit for the purpose of Copying Plans on, excepting in cases of great hurry, which seldom occur. It will not carry the Ink, and besides is quickly destroyed by Vermin[3]; ...

whilst later the Directors write out,

An inconvenience arises from the use of Europe Paper in large charts as the sheets cannot be well joined, and as there is an elasticity in the paper which makes it impossible to draw straight lines upon it of considerable length; We shall order our Supra-cargo in China to send to you and other settlements some transparent China Paper, which is more commodious for large charts, and facilitates the operation of copying them, and at the same time it is not injured by folding [45][4].

In 1798 Andrew Hemmonneau was granted a pension of Rs. 120 a month[5] on the Surveyor General's recommendation;

In the year 1773 Mr. Hemmonneau entered as a draftsman in the Chief Engineer's office at Fort St. George under Colonel Ross, where he served until 1781, when he came to Bengal. He was admitted as a draftsman in the Surveyor General's office by the late Lt.-Colonel Call, and continued to act in that capacity successively under Colonels Wood and Kyd, until the office devolving to my charge, I found Mr. Hemmonneau amply qualified to execute any works; and I continued to employ him as head draftsman, until a weakness in the eyes, incurred by long and unremitted application to maps obliged him to desist from that duty[6].

He did not enjoy his pension long, for he died at the end of the following year.

[1] CD to B. 20-8-88 (13, 14, 26). [2] BMC. 14-3-94 (14). [3] BPC. 13-1-92 (8). [4] CD to Bo. 25-5-98 (30). [5] Boisseau was granted similar pension from 1-9-1804. [6] DDn. 16 (80). 12-7-98.

CHAPTER XVI

MAPS OF MADRAS & BOMBAY

Early Maps of the Carnatic, to 1780—Kelly's Atlas of 1782—Madras Maps, 1780–1800—Draughtsmen—Maps of the Nizāms Dominions—Maps of Bombay.

THE earliest maps of the south peninsula appear to be Dutch, of the 16th or 17th centuries, two of which are;

A map of the peninsula south of 15° 20′ entitled *Nova Tabula: Terrarum Cucan*[1], *Canara, Malabaria, Madura, & Coromandalia*; by Hadriano Relando, scale about 2¼ inches to a degree. The coast line is deeply indented, very little internal detail is shewn, and the map is decorated with animals, ships, and other ornamentation[2].

A coloured chart of the coast of the southern peninsula, with Ceylon and the Maldive Islands, by Jaspar Gentet of Batavia, scale 4½ Dutch miles to an inch[3].

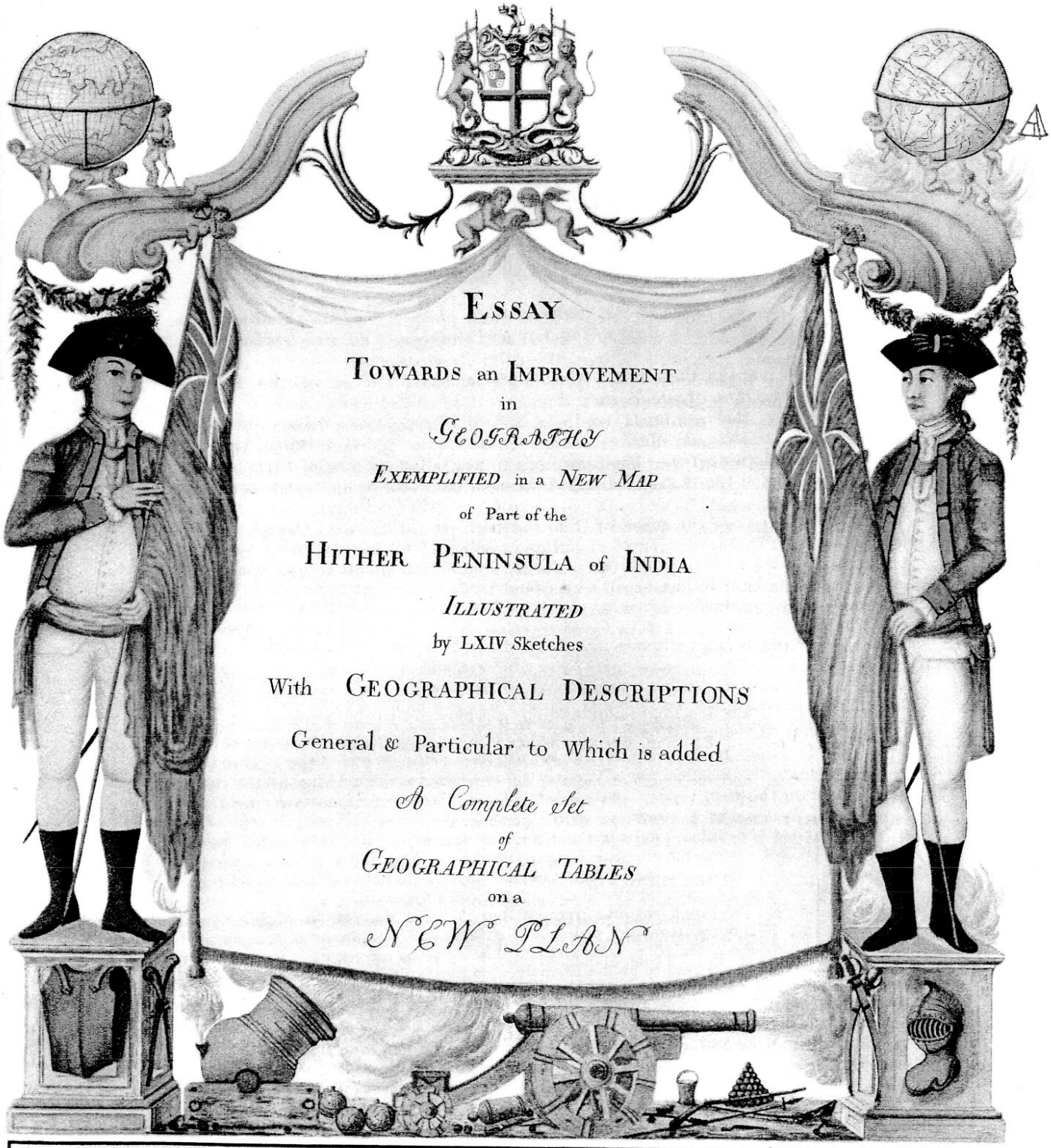
Bernoulli gives a very curious map, *Portion d'une Carte du Sud de la Presq'île de l'Inde*, "faite par des Brahmins, que comprend le Tanjour", which gives positions and names of towns, with stiff wide rivers[4].

Delisle published in 1723 a *Carte des Côtes de Malabar et de Coromandel*[5], and other maps of the coasts.

The first map of the interior, of any merit, was that sent home by Father Bouchet [86], entitled "*Partie Meridionale de l'Inde*, par les RR. PP. Jésuites, 1722", scale one inch to a degree, extending slightly north of parallel 14°. It shows political divisions strangely different to later geography; there are several *Royaumes; Carnate*, lying entirely north of the Pālār river, *Gingi, Tanjaour, Madurey, Maissour*, besides the *Terres de Chilanliken* between Gingi and Mysore, *Marava*, and on the west coast *Canara*, and *Solarin*, the latter name covering both Malabar and Travancore[6]. Jefferys writes of this map;

> Europeans had but confused ideas of the inland and southern Parts of the hither Peninsula of the Indies, before the Missioners, especially the Romish, entered those countries to propogate their Religion; and, as for more than a century none but they had visited them, none but they were able to give the World exact Informations concerning them. ...
>
> In 1719, Bouchet the Jesuit sent into France a Map of their Missions in Madurey[7] and the neighbouring Kingdoms, together with the Latitudes and Longitudes of the principal Places, as they had been observed, or otherwise calculated, by the missioners.
>
> This Map, which is prefixed to his letter at the Beginning of the fifteenth Volume of the *Lettres Edifiantes et Curieuses* [11 n. 2]...includes...the space of above six Degrees, that is from Cape Comorin to beyond Palliakata[8] on the East side; and from the same Cape to Onor[9] on the Malabar Side.
>
> But this Map being drawn by a small Scale of not quite an inch to one Degree of Latitude, and consequently not capable of giving the Countries in any considerable Detail; the Jesuits sent over several manuscript Charts, and other Materials, from whence Mr. D'anville composed a new Map; which, being drawn by a Scale near twice as large as the former, is a great Deal more particular as well as accurate, and extends farther north[10] [210].
>
> From this map, with the Assistance of Travellers and other Materials, ...we were preparing to draw our Map of the Seat of the War, when Mr. D'anville's two-sheet Map of that Coast appeared, accomodated with the Roads in great Detail: the Space of above five Inches

[1] Konkan [121 n. 8]. [2] BM. K. 115 (61) & *Imp. Lib. M. & P.* 413. [3] Cat. of old Dutch maps of India; pub. The Hague, 1867. [4] Possibly the map copied by Anquetil-Duperron (qv) in Bombay; Bernoulli, II (vii). [5] BM. K. 115 (62). [6] BM. Addl. MSS. 15331 (14). [7] Madura, 58 K/1. [8] Pulicat, 66 C/7. [9] Honāvar, 48 J/7. [10] Pub. 1737; *Nouvelle Carte d'une grande partie de la presqu' Ile des Indes*...dressé sur deux cartes ms. des *Jésuites*. IO. Tracts. 284 (164).



ESSAY

TOWARDS an IMPROVEMENT

in

GEOGRAPHY

EXEMPLIFIED in a *NEW MAP*

of Part of the

HITHER PENINSULA of INDIA

ILLUSTRATED

by LXIV Sketches

With GEOGRAPHICAL DESCRIPTIONS

General & Particular to Which is added

A Complete Set

of

GEOGRAPHICAL TABLES

on a

NEW PLAN

HUMBLY INSCRIBED

to

THE HONORABLE WARREN HASTINGS ESQUIRE

GOVERNOR GENERAL

&.ª Gentlemen of the Supreme Council

of

India

By their Most faithful & Most obediant

Humble Servant

Robert Kelly

and a Half which he assigns to a Degree, having allowed him to describe the Country very minutely, in Comparison of anything which hath been hitherto published. He was employed in this Work by the *French* East India Company. ... In this he has made several alterations from that of 1737; and even from his first sheet of Asia, published in 1752 [210–1].

His map is accompanied with a very copious Analysis, full of Geographical Erudition; and as we have taken our Map in a Manner wholly from his; we shall not scruple to make use of his Remarks, so far as may serve our Purpose.

Our Map extends from South to North the space of four Degrees, that is from the tenth to the fourteenth parallel of Latitude [1].

D'Anville's two-sheet map appeared in 1753, and was entitled "*Carte de la Côte de Coromandel;* pour La Compagnie des Indes; 5 pouces 3 lignes au degree", and covers the country between parallels 10° 40′ and 17°; the only meridian shown is that of Pondicherry, 77° 25′ east of Paris [2]. It was republished in London by Jefferys in 1754, accompanied by the memoir above quoted, in which some shrewd remarks are made as to the spelling of names [249] and the importance of both maps and histories being supported by proper authorities; "a history without vouchers ought to pass for a History of the compiler's own Invention [3]".

Jefferys' map appeared as frontispiece to Cambridge's History that was published in 1761, together with a "*Map of the Kingdom of Madura, with the South coast of Malabar,* ...exhibiting the marches of the British Troops into the Tinnivelly Country", on the scale of 12 miles to an inch [4] [87].

Another map of this period is by J. Hook, 1760 [5];

A new Draught of the Coast of Choromandel from Negapatam to Pullicat, with the true distances from the Principal Places from Tripudy as far as the mountains of Canavayas to Trichinopoly.

Orme published three maps of southern India, compiled and drawn by Kitchen [211 n. 2], to illustrate his History [6].

A Map of the Coast of Coromandel from the River Gadevari to Cape Comorin.

The greatest part of this Map is copied from Mr. Danville; but there are some additions, the Materials of which were not known to that excellent Geographer. [These additions were various routes marched by English troops between 1755 and 1766 [7] [87]. The map is in two sheets, scale $3\frac{1}{4}$ inches to a degree, and includes Ceylon.]

The Countries of the Coromandel from the Coleroon to Cape Comorin. Madura and Tinnivelly from maps compiled for the East India Company by John Call Esq. Chief Engineer.

The Carnatic from the Pennar to the Coleroon, with the Western Mountains and part of Mysore. Published...1778. [The scale of these two maps is $5\frac{1}{2}$ inches to a degree.]

For his *Map of Hindoostan* Rennell acknowledges,

A French MS. map, which contains the Southern Carnatic, and which has afforded me much assistance, ...and some few particulars are from the engraved French Map of 1771, whose principal merit is confined to the southern part of the Carnatic [8].

This latter is probably one entitled. "Théâtre de la Guerre dans l'Inde sur la Coste de Coromandel, par M. B. C. T., gravé par Goisey [9]" It is on a scale of about 16 miles to an inch and contains large-scale insets of important towns; the main map shows battle sites, with the names of the French officers commanding, and whether won or lost.

In 1770 Henry Montresor completed a map of the Southern Peninsula from material in the Chief Engineer's office [10], which was acknowledged as an authority by Rennell and others for many years [11] [3, 98]. Four years later the Chief Engineer, in sending a map to General Clavering of the Supreme Council, writes;

You have rightly judged of my reasons for not drawing the Latitude and Longitude lines; as well as the separations between the Country's and the Divisions of the Districts, as I thought it was better not to run the risk of misinforming you by inserting them at random, when possibly I might hereafter be able to render them complete. Mr. Barnard's survey will furnish me with that of the Jaghir, and I hope what is now doing to the northward will enable me to lay down these Circars with exactness [12] [3].

[1] Jefferys, (3 4). [2] IO. *Tracts.* 284 (165). & BM. K. 115 (72). [3] Jefferys. (preface). [4] Cambridge (1, 83) & BM. K. 115 (71). [5] Mack. MSS. LXIX. 10–8–91. [6] Orme, Vol. III. [7] Orme MSS. XIII (16). [8] *Memoir,* 1793 (273–4, 267). [9] BM. K. 115 (74). [10] MMC. 25–6–70 & 28–1–71. [11] *Memoir,* 1793, *passim.* [12] Mack. MSS LXVIII, 10–12–75.

D'Anville's map and the reproduction of it by Jefferys still remained the only printed maps available to the Company's soldiers and civil servants, Bonjour [89] referring to the former as "the best we have of this part of the World", whilst Pearse had nothing larger than Jefferys' for his march from Bengal in 1781 [41], when he wrote to Fort St. George;

I humbly request if you have maps of the country I am to march through, that you will order your surveyor to send me one. Jefferys' is the best, but I fear it is on too small a scale for military uses, for it is necessary for me to know every village within ten miles of my route, with which, and Hircarrahs, I can come at a competent knowledge of the country, and be able to form any judgement of the motions of the Enemy, if any come towards us. ...

I shall be very thankful for some Hircarahs that can be relied on, who know the country; ...what I pick up may be very good, but they are strangers to me and my People, and may be sent by the Enemy on purpose to mislead and misinform. A few well known at the Presidency would enable me to guard against such Practices, as they would enable me to point out those who might be relied on[1].

This reliance on information provided by *harcaras* is frequently referred to as one of the greatest drawbacks caused by the lack of good maps [89, 95, 241], but so long as the Nawāb of the Carnatic objected to a systematic survey of his country [3, 90-1] there was no other way of collecting information off the main surveyed routes.

KELLY'S ATLAS OF 1782

In 1778 Robert Kelly, who had been one of the most persistent surveyors of military routes for several years [89–90], offered to compile an atlas to cover the whole south peninsula with a uniform series of maps;

First I propose a General Map of the Deccan and Carnatick, chiefly laid down from actual Surveys, Corrected by Astronomical Observations, and divided into Squares, or rather Parallelograms, each containing One Degree of Latitude and Longitude, amounting in all to Sixty four, each of which will be illustrated by a particular sketch on a large scale [242]. ... And to render this Work the more useful, an Alphabetical List of all the Towns and Forts contained in the General Map will be printed in a separate Book, with their Latitudes and Longitudes, the Number of the Square they are contained in, and the particular Book and page in which each may be found among the Enlarged Sketches.

To this will be added a Book of Surveys of all the great Roads on a Scale of two inches to a Mile, or Eight times the size of the Sketches. In this will be minutely delineated all the Topes, Tanks, Wells, Rivers, Watercourses, Morasses, Hills, Rocks, Passes, Woods, &c. &c., which it may anywise concern an officer to know. ...

The whole Work to be illustrated by a Geographical and Military View of each Province, Its Natural and Artificial strength, with the best Account that can be Obtained of the Military Force, Connections and Resources of the several Chiefs or Potentates under whose Dominions they are at present. ...

For the Compilation of this Work I have many Materials already in my hands not yet reduced to form; Many more are to be Collected from the Engineer's Office [256–7], And the rest I hope to obtain with your permission and Assistance in the course of a year[2].

After calling upon him for an estimate of the cost, the Madras Council forwarded Kelly's proposal to the Directors;

He lately proposed the scheme again to us, and gave us some idea of the expence, which appeared much too great for us to engage in without your sanction; the plan seemed likewise too extensive, taking in many objects which are not necessary to such a survey of the Country as you require for the Assistance of your Military operations[3].

Kelly's proposals included the establishment of a regular survey department involving considerable expence, which the Directors could not face [263], and in 1782 he visited Calcutta, and laid his specimen atlas before the Supreme Council. This atlas is still preserved[4], contained in two substantial volumes described below[5];

[1] MMC. 22–4–81. [2] MMC. 22–12–78. [3] M to CD. 14–10–79 (43). [4] SGO. Lib. Sp. 7, 8. [5] The small type does not here represent exact quotation.

Title Page [pl. 15]. Headed by an elaborate and brightly coloured picture in the form of an heraldic device. The arms of the E.I.C., with two globes, one of the world the other of the heavens, supported by cupids, one using a pair of dividers, another a sextant; the two supporters are officers of the Madras Infantry; the tailpiece shows a collection of artillery ordnance, with a mortar and gun being fired.

Title, "Essay towards an improvement in Geography, Exemplified in a New Map of Part of the Hither Peninsula of India, Illustrated by LXIV sketches with Geographical Descriptions, General & Particular, to which is added A Complete Set of Geographical Tables on a New Plan."

Inscribed to the Governor General and Supreme Council, by Robert Kelly, 1782.

Address to the Governor General; "In the course of nine or ten years service on the Coast, I could not avoid observing many bad consequences which arose from the want of accurate Maps of the country. ... An officer's sole dependence...was necessarily placed on his Hircarahs, a race of designing knaves, whose Ignorance of the Country, Treachery, or Cowardice in the time of danger, had often caused the miscarriage of the best plan'd expeditions [89, 95].

"From all these considerations, ...I was induced to set about some such work as...might be of general use, and at length, in the year 1770, selected this Plan. ...

"But, after carrying it on for a few years, occasionally as my duties in the military line permitted, ... I made some attempts...to obtain the sanction & assistance of Government to carry it on with that vigor which I thought it merited. The former, I obtained in very flattering terms; but, ... the latter never coming to hand, I was obliged to go on as before, making such observations & surveys as my finances enabled, and my duty permitted me [89–90].

"In Sir Thomas Rumbold's[1] Government I made another attempt, & again succeeded in obtaining the sanction of Government, but with limitations; And the small allowance granted to assist me in carrying on the work was so very inadequate to my expences, that I was exceedingly happy when it was discontinued, a few months after it had been granted [97–8]

"At length I have brought it to such a state in which it is now presented. ...

"I am convinced it may be of great public utility during the present war; there being no maps of the Peninsula which can be equally relied on. ... By their assistance, the Gentlemen ot the different Presidencies, but particularly of Madras, will be enabled to Plan their operations with more precision; and to trace out the routes of their armies and detachments (as well as those of the enemy). ... I promise that, should it be so fortunate as to claim the attention of the Hon'ble the Court of Directors, so as to produce their orders for its completion, the next edition shall give perfect satisfaction."

General Description. The Atlas covers that part of the Peninsula that lies south of the 17th degree of North Latitude.—Description of the country, its geography, its climate, and its peoples.—List of the Passes leading through the Eastern & Western Ghauts.

The Grand divisions of the Peninsula [pl. 9].

"Although the Southern boundaries of the Mahrattas & Nizam's Countries are exhibited in the upper part of our General Map, as well as part of the English possessions in the Circars, yet it is not our intention to include them in our Grand Divisions of the Peninsula; ...they are to be the subject of another work. ...

"Our modern conqueror of the Peninsula [Haidar Ali] has saved us a great deal of trouble since he assumed the Government of Mysore; Not having left an independant Prince or Chief of any denomination (out of the Carnatic) between the River Kristnah & the Travancore Country, Bassaulat Jung excepted".

1st Grand Division. Bassaulat Jung's Dominions [86 n. 2], The Guntoor Circar and Adoni; excluding the Palnaud, which interposes.

2nd Grand Division. Hyder Ally's Dominions, before he entered the Carnatic in July [1780].

3rd Grand Division. The Nawab of the Carnatic's Dominions, before Hyder Ally entered his country in July 1780.—The Company's Jaghire about Madras.—The Tanjour Country, at present under the English protection.

4th Grand Division. The Travancore Dominions, Independant.

Then follows a map and description of each of these Divisions;

1st. Includes the districts of Savenour, Adoni, Kanol[2], Soorapet and Guntoor; forming a strip south of the Kristnah River, separating the Nizam's Dominions from Mysore and the Carnatic.

[1] Governor of Madras, 1778–80. [2] Savanur, 48 N/5; Adoni, 57 E/6; Kurnool, 57 I/1.

2nd. Bounded by the Mahrattas and Adoni on the North; by the Carnatic on the East; Coimbatoor and Salem belonging to Hyder Ally; by Travancore on the South.—The position of all the passes is shown.

Coorg is not shown at all; "the Biddenoor[1] Country" fills the basin of the upper "Tungaboodra".

3rd. Map of the Carnatic, extending from the Kistna to Travancore, with description of the changes in the extent of the Carnatic that had occurred during the 18th century. "The Natives of India never think of surveying large territories, or of settling their boundaries in anything like straight lines; ... in the center of a district fifty or sixty miles broad it is common to meet with village belonging to the neighbouring districts.

4th. Geographical and historical description of Travancore, with map.

The Degree Sheets. Index map shewing the division of the Peninsula, south of parallel 17°, into degree sheets. These are lettered A to I southwards from parallel 17° to 8°, and numbered 1 to 9 eastwards from meridian 89° to 99° [pl. 9]. These meridians denote longitude east from Ferro [176 n. 1][2], and are also numbered from 71° 28′ to 81° 28′ East from London.

The "grand divisions" [241] are distinguished by different colours.

Then follow the 64 degree sheets, on scale about 13½ inches to an equatorial degree, or about 5¼ miles to an inch [248][3]. They contain very little detail, except in the coastal areas near Madras and Pondicherry.

They show main rivers, surveyed routes, villages and towns; ranges of hills are shewn conventionally like little sand-hills; undulating ground is indicated by light shading; forests by tree symbols. The boundaries of provinces and districts are shewn by narrow ribands.

Many of the sheets carry clever little headpieces, illustrating some prominent place; for example, the Masulipatam sheet is headed by a high masonry fort, a sepoy with musket standing alongside a cannon aiming down through the battlements; there are the masts of shipping beyond the fort, bundles of merchandise and a large anchor in the foreground.

Kelly closes his letter to the Supreme Council by saying that the Directors will perceive that there are large tracts of country even in the Carnatic, and many more on the Malabar Coast, yet unsurveyed and very imperfectly known. That I have therefore purposely left those spaces vacant on my maps, that they may in time be filled up by the observations of some future surveyors, or occasional travellers through those countries. ... That my wish and ambition is to see this work filled up with accurate surveys as soon as possible[4].

The Council allotted him a gratuity of 30,000 arcot rupees [279 n. 1] in acknowledgement of his labour, and commended his maps to the Directors;

From the apparent accuracy with which they are drawn, and the utility of the plan on which they are constructed, being calculated both for present use and the easiest reception of future improvements, until the provinces in Decan and Carnatic shall have been completely surveyed, they appear to us a most important and useful acquisition; ... they have already proved a serviceable guide to General Sir Eyre Coote in regulating the motions of his army[5].

Two years later Kelly submitted his survey of Fullarton's marches [98],

from the results of which I purpose making it the basis of a new edition on the same plan as that which I had the honor of lodging in the Council Room at Calcutta; with the Longitude calculated from London, and some other improvements in the Geographical Tables.

I have already began this new map, and wish to know whether any answer hath yet been received from England relative to the proposed survey, which may authorise me to proceed in that useful work, ere my rank and station in the army prevent my paying that attention to it which is absolutely necessary to bring it to any degree of perfection[6].

Though no money was forthcoming for the development of Kelly's schemes, he continued working on his atlas in his own time, and in 1786 sent home to the Directors "a map of the Southern parts of the Carnatic, drawn on a large scale, referring to some of the Military operations of the late War"[7], which was passed to Rennell, and embodied in the later edition of his map.

In the published account of Fullarton's campaign is a frontispiece map entitled *Sketch of the Southern Countries of India,* traversed by the Armies commanded by Colonel Humbertson and Colonel Fullarton. Scale about 25 miles to an inch[8];

[1] Bednur [125]. [2] One of the Canary Is. about 18° W. of Greenwich. [3] Degree along parallel 16° measures 12 inches; along meridian, 13·7 inches. [4] BPC. 27–5–82. [5] B to CD. 15–7–82 (22). [6] BPC. 28–6–84. [7] Misc. LR. 78 (251), 7–6–86. [8] also reproduced in Vibart.

which he describes thus;

Mr. Faden, Geographer to His Majesty, has completed a Map of the Southern Provinces of India, from Madras to Cape Comorin, on a large scale, according to the plans of Colonel Kelly, Captain Wersebe, and other accurate surveyors. In this map, the movements of the Southern Army, during the Campaigns of 1782, 83, and 84, are faithfully traced, and the errors of Former Topographers are carefully corrected[1] [220].

MADRAS MAPS, 1780–1800

There is at Calcutta a map of the Peninsula of India, south of the parallel of Surat, of which nothing is known beyond an office note "Père Klumine's Map of India; 1784–1800?"; it may be a very great deal older[2].

Rennell makes constant references, not only to Kelly's map of Fullarton's marches, but also to two others;

Wersebe's map of Tanjore, contains more particulars than any other that I have seen; especially in the northern part. And for the southern parts, I had some assistance from the map of Mr. Sullivan. More particulars appear in the Marawar and Madura countries, than in any former map that has been published. After the great roads specified in the discussion of Kelly's map &c., most of the new matter is from Mr. Dalrymple's collection[3]; and the rest from Wersebe and Sulivan[4].

[A map] communicated by Mr. John Sulivan, contains the whole peninsula south of the parallel of 15°; and is particularly valuable on account of its having many routes and situations in Mysore, and Bednore; as well as in Tanjore and Madura[5].

Neither Wersebe's [99] nor Sulivan's map has been indentified, nor is there any clue as to the author of Sulivan's map, of which Rennell believed "there is no other copy in Europe".

Rennell makes no mention of Schlegel's map [99], which was possibly unknown to contemporary geographers, as it was sent home to be presented to King George III as Elector of Hanover[6], and passed on his death with the King's Library to the British Museum.

This is on the scale of 5 miles to an inch, and extends from Madura on the south to Pulicat on the north, and from the east coast to the *ghāts* leading up to Mysore. It is beautifully drawn and handprinted, being drawn in colours with a most artistic title piece; the hills are brush-shaded, some in the conventional "caterpillar" form, others in elevation; the draughtsman was F. L. Rothmeyer, Sergeant of the 13th Electoral Regiment of Foot. There is a long note describing the lay-out of the principal points of control and the more striking differences of the map from those already published [169].

In 1788 Rennell supplemented his *Map of Hindoostan* with a larger map of the Peninsula;

As the peninsula...contains more interesting matter than could well be comprised within the space furnished by such a scale as could conveniently be applied to a general map of so large a tract as India; it was judged necessary to form another map of the peninsula, on a much larger scale; but an accident has retarded the publication. ... The scale of this map is just double that of the general one[7].

This map was entitled;

Peninsula of India from Krishna River to Cape Comorin. Drawn chiefly from materials in the Collection of Alexander Dalrymple Esq.; J. Rennell. London. November 1st 1788. Engraved by Phillips & Harrison, London[8].

It is on the scale of 3 inches to a degree. A second edition, scale 2 inches to a degree, was issued in 1792 to show the "political division according to the Partition Treaty made at Seringapatam in 1792[9]", and a special memoir, dated 1793, was published at the same time [214].

[1] Fullarton (Advertisement). [2] MRIO. 96 (2). Scale 24 m. to 1 inch. [3] Maps in BM. Addl. MSS. 15739, presented to BM. by Admiralty in 1844, may have formed part of this collection. [4] *Memoir*, 1793 (275). [5] ib. (267). [6] State Archives, Hanover. Ha. Des. 92, LXXXV. S. Nr. 12. [7] *Memoir*, 1788, 214. [8] BM. K. 115 (65, 1). [9] MRO. Map 23, & *Memoir*, 1793 (preface).

The following passage from this memoir illustrates the difficulty that confronted early geographers in the estimation of height; the direct height of a visible hill could be ascertained trigonometrically, but the height of an undulating plateau was in those days indeterminate.

The Balagaut Carnatic, or Table Land...is strongly marked in the map. ... The terms Balagaut & Payengaut respectively mean the regions lying above, and below, the Gauts. ...

We are not yet informed concerning its exact height, but are told vaguely that it is 3000 feet at the eastern side, opposite to Madras, unquestionably the highest part on the eastern side of the Peninsula, because from this parallel the waters decline to the north and south; and as they universally decline to the east, we have a proof that the western side is higher than the east; and it is by far the steepest. ...

All the waters that are collected on this vast extent of Table Land from Coimbatore to the neighbourhood of Surat, run to the eastward; proving as we have said before, a general declivity of the ground towards that quarter [1].

In 1794 the Supreme Government wrote to Madras and asked for a General Map of the Carnatic (including, and distinguishing, the Ceded countries), to be taken from the best surveys on which the Roads, communications, and passes, are accurately laid down [2].

This was entrusted to the Chief Engineer [3], who submitted it three years later, reporting that,

From the time that this Map was first called for, until a few months since, I had been left without any assistance in the Office, every Officer of the Corps having been employed at different stations, and on the several expeditions to Ceylon and the Eastward; my own avocations as Chief Engineer taking up so much of my time as to prevent me engaging in the compilation of the Map in the manner I wished, and when I had completed the Carnatic, I detained it a few months to render it more complete by adding the Island of Ceylon to it. ...

List of Maps and Surveys from which the General Map of the Carnatic is compiled; ...

The Sea Coast from Point Calmere to Point Gaudavery taken from the late Mr. Michæl Topping's Surveys.

The Jaghire is taken from Mr. Barnard's and the late Captain Pringle's Survey.

The Ceded Districts [4] taken from surveys made by Major Allan.

The Masulipatam District from Surveys in the Chief Engineer's Office.

The Vizagapatam District, do. do. do.

The Ganjam District from Mr. Cotsford's Survey.

The Island of Ceylon from a Survey made in the year 1789, by order of Mr. Van de Graaf, Governor [5].

In 1800 Colebrooke, Surveyor General at Calcutta, submitted to Government a map of the South Peninsula compiled from all the latest maps and surveys, including Gent's map described above [254];

The Map which I have now the honor to submit to your Lordship, although the result of considerable labour, is only a part of a more general and extensive work, which I purpose to continue on the same or occasionally a larger scale [220].

The materials used have been chiefly those deposited in the Surveyor General's office, collected with such others as I have been enabled to procure. A list of these I take the liberty of enclosing, with a paper on the subject of the Longitude [180], and pointing out some of the chief circumstances in which this map differs from any former Construction of the Peninsula by Major Rennell [6] [243].

It is possible that this is a map that was sold to the British Museum in 1843;

Map of the South Peninsula. Scale about 8 miles to an inch. [Bears no date, but from the political divisions must have been drawn about 1800. Very well drawn and coloured. In two sheets. The Northern sheet between parallels 11° and 14°, the southern sheet from parallel 11° southwards [7].]

DRAUGHTSMEN

Throughout this period the only Madras officer officially responsible for drawing and copying maps was the Chief Engineer [252]. In 1783 he told Government that,

[1] *Peninsula* (14–6). [2] B. Pol. C. 31–3–94. [3] William Gent, then acting for Ross. [4] Coimbatore, Bāramahāl, & Salem. [5] BMC. 3–11–97 (1, 2). [6] B. Pol. C. 10–7–1800. [7] BM. Addl. MSS. 14392 (a, b,). Map bears note "Purchased of J. Graham, 19–7–1843." There had been a Head Draughtsman of this name at SGO, Calcutta, before this date.

There were formerly several Draughtsmen employed in the Drawing Room[1] [237], ... At present there is but one, and he, though of considerable merit in his Lore, at five Pagodas a month only, a sum certainly not sufficient in this time of scarcity to keep him above want[2]. ... Colonel Kelly and Mr. Gomond give from their private purses to their Draughtsmen from 15 to 25 Pagodas per month each[3].

As a result of the Chief Engineer's representations a Baron Reichel, who had recently arrived in Madras, was appointed on October 28th 1783;

After a few months residence at Madras, Baron Reichel, being informed that orders had been received from the Court of Directors, directing that certain plans in the Engineer's Office should be immediately reduced to a particular scale, and, thus prepared, should be transmitted to England [251–2], took the opportunity to address the...Governor, soliciting that he might be employed in that line. ...In consequence of which, the Hon'ble the Governor and Council did him the honor to appoint him Assistant Surveyor under the Chief Engineer, to be employed in preparing plans for the Hon'ble the Court of Directors, with a salary of 118 Pagodas for a month of 31 days. ... Which employ he fulfilled for the space of near eight years[4].

The Directors were all for economy;

We require exact, not finely finished, Copies, and the Officer, whose plan of the attack of Cuddalore you have transmitted, could have made Tracings of several, if not all, of those we particularly pointed out, in less time than this one finished plan required. We do not mean to discourage any person from finishing his work neatly, ... and only intend a necessary preferance of what is needful [236][5].

In 1786 the Chief Engineer recommended the employment of Mr. Dorman, an English draughtsman, as Head Draughtsman "to relieve me from the Dependence I have hitherto been obliged to place in foreigners [236][6]" and on the death of Dorman in 1788, Mr. Wood [236 n. 5] was appointed on a salary of 40 pagodas a month[7]. In 1791 the Chief Engineer reported that,

Baron Reichel is the only one [Surveyor] under my direction out of the Corps; he had been heitherto employed in preparing Plans for the Court of Directors, whose approbation you will perceive he has merited[8].

Orders were however received from England that on account of his being a foreigner, Reichel should no longer be employed[9].

MAPS OF THE NIZĀM'S DOMINIONS

For many years the only knowledge of the Nizām's Dominions was derived from Bussy's marches [115], and there was no attempt at regular survey until Mackenzie was attached to the subsidiary force in 1792 [116].

With the help of route surveys by other surveyors as well as his own, and by such local information as he could collect, he completed his first map in 1796[10], and submitted it to Government the following year with a full memoir describing its construction [116-7]. He writes,

In the year 1796, a general Map of the Nizam's dominions was submitted to Government for the first time, compiled and digested from various materials of various authority described in a Memoir that accompanied it; and designed as a specimen for future corrections, and shewing that was wanted as much as what was done. It had however the use of bringing the subject into one point of view; further inquiry improved its supplements in 1798 and 1799[11].

MAPS OF BOMBAY

Reynolds submitted his first map of western India at the end of 1787 [127], and gave with it an account of all the surveys which he had incorporated with his

[1] Mr. James Gillispie to be employed as draughtsman, CD. to M. 2-2-81 (35). [2] MPC. 28-10-83. [3] Mack. MSS. LXVIII, 11-3-83. [4] MPC. 12-12-94. [5] CD. to M. 9-12-84. [6] Mack. MSS. LXIX, 18-5-86. [7] ib. 1-8-92 & MMC. 14-3-88. [8] Mack. MSS. LXIX, 7-1-91. [9] CD. to M. 4-1-91 (4). [10] Map, dated 30-7-96, BM. Addl. MSS. 23102 (B). [11] MRIO. 65 (5) Scale 12 m. to an inch; H. H. Wilson (vii-viii).

own work, distinguishing certain areas as inserted "from information only". The map covered Gujarāt, Mālwa, the Konkan, the Marātha Deccan, and Berār, and he writes,

A great deal of information still remains to be acquired, and I trust that I shall be enabled...to complete hereafter a more perfect Plan [1].

As time went on, he found himself able to extend surveys over a wider area, and conceived the more ambitious plan of a general map of India, but was unable to settle down seriously to its preparation till 1795. In granting approval to this undertaking the Directors provided that besides the general map, he should give a *particular* map of each province. As has already been explained, the exact extent of Reynolds' completed map is not clear, though he had intended to cover the whole of India with the exception only of Bengal [217].

The general map, of which the final copy was sent to the Supreme Government in 1809 [219], was on the scale of 9 inches to a degree.

The following are some of the *particular* maps, all on the scale of 18 inches to a degree, except where otherwise stated;

Map of Scind & Cutch, shewing the Mouths of the Indus. Map of the NW. part of Cutch, & the East branch of the Indus, as high as Kaunpoor [2].

Part of Berar, Bedar [3] & Hyderabad, to the East.

Part of Berar, Bedar & Aurangabad [4] to the West.

Map of the Dukhan & Konkun. 15° to 19° N; 73° to 78° E. Part of Malwa 20° to 25° N; 73° to 76° E. Part of Malwa 22° to 24° N; 76° to 79° E.

Country between the Tapatee [5] & Nerbudda.

Map of the Punjab & the Countries about Delhi and Panput. 27° to 35° N; 70° to 78° E. Part of Hindoostan. 24° to 27° N; 75° to 76° E. Country beyond Ajmere; 9 inches to a degree. 24° to 27° N; 73° to 75° E.

[It was noted in 1833 that the information on this map was not to be found elsewhere].

River Indus, with adjacent countries. 25° to 29° N; 67° to 70° E.

Map of the Sīnd & the Indus, continuation of above to the south.

Map of Rajpootana. 25° to 27° N; 72° to 71° E. Map of Thull or Great Desert. 24° to 27° N; 69° to 71° E.

Part of the Coast, Vizagapatam to Balasore; scale 9 inches to degree. 18° to 23° N; 82° to 88° E.

[This is the only section that lies so far east: the bulk of Reynolds' work fell to the west].

Map of the Peninsula of Guzerat, with country to Gwalior & Calpee [6].

[1] BoS. & Pol. 8–1–88. [2] Khānpur, 39 L/10 or Khairpur, 40 A/14? [3] Bīdar, 56 G/9. [4] 47 M/5. [5] Tapti R. 46 O, K, C. [6] List of Maps in SGO. Bombay, 1833. MRIO. M. 564.

CHAPTER XVII

MAP CONSTRUCTION & PRESERVATION

Scales—Projections—Orthography—Maps for Court of Directors—Co-operation between Presidencies—Custody & Distribution.

THE scale first used by Rennell for his survey of the Ganges was 4 inches to a nautical mile [182], or " 500 yards to an inch, or 8 inches to a coss[1] ". This use of the *coss* as a scale unit was frequent with early surveyors and map-makers because distances were thus obtained from native information and travellers' journals. Both D'Anville and Rennell discuss the length of the *coss* which varies in different parts of India from 1½ to 2 British miles[2].

Rennell soon reduced his scale of protraction to two inches to a mile; whilst of his compiled river maps he writes,

Having now compleated the survey of the Ganges &c., I proceeded to construct a Set of Maps of it, on a Scale proper for common Use (2 miles to an inch), to be divided into 3 parts, each on a Sheet of Royal Paper, and a fourth Sheet to contain the whole on a Scale of 10 English Miles to an Inch[3].

After receiving Clive's orders " to set about forming a General Map of Bengal ", he adopted for that map the scale of 5 British miles to an inch, whilst for his reduced maps he used the scales of 10 and 20 geographical miles[4] to an inch.

On one of Rennell's early maps the scale heading reads " A scale of English Statute or measured miles (69½ = 1 degree)[5], and 2 of them to one Coss ", there being no statement that the actual scale of the map was 5 British miles to an inch[6]. It was usual thus to define the length of the scale *unit*, leaving the scale *ratio* to be found by measurement along the drawn scale.

Though Rennell's surveys were all compiled into 5-mile maps, yet his surveyors were required to make their original protractions on the scale of 2 miles to an inch [183], as also ordered by Colebrooke in 1794 [188].

In Madras, the Chief Engineer first proposed that the Northern Circārs survey should be made on the scale " of an inch and a third to a mile, which...Capt. Stevens has begun on ", but his final instructions to the surveyors read,

The General Survey may be laid down to a scale of two inches to one mile, from which that of the particular districts may be reduced to a scale of six or twelve Inches to a Degree, ...and the whole afterwards formed on a Scale of three Inches to a Degree, aggreeable to the Orders of the Hon'ble the Court of Directors[7].

In 1771 the Directors had sent out orders to all their Presidencies laying down specific scales for surveys and maps;

The Extent and importance of the Company's possessions have made us sollicitous to obtain a General Chart of India, but we must be greatly obstructed in such a design while the maps and Chart we receive from our several Presidencies are drawn upon scales dissimilar to each other, and as the fixing one certain scale will greatly facilitate the formation of a General Chart, we shall direct our servants at our different Presidencies, that their general maps must in future be formed on a scale of three inches to a degree, and all particular surveys of Districts or Provinces on scales of six or Twelve inches to a degree, as may be thought most proper for the purpose; by these means the separate Charts will be reduced more easily to a General one[8].

[1] Journal, Orme MSS. 7; entry for 19–5–64. [2] 37 to 43 *coss* to a degree, D'Anville (14); 35 to 46, *Memoir* 1793 (4–5). [3] La Touche (36), 1–1–65; cf. Hirst & Ascoli. [4] 60 *geographical*, or *nautical*, miles to a degree on a great circle. [5] Many catalogues wrongly quote this simple definition as being the *scale* of the map. [6] Map, MRIO. 51 (3). [7] MMC. 22–3–73. [8] CD to B. 10–4–71 (62).

In spite of this order, Rennell retained the scale of 5 *British* miles to an inch for his provincial maps; though his scale of 10 geographical miles to an inch conformed to the order, being equivalent to six inches to a degree; and on this scale he submitted his particular maps of *Bengal & Bahar* in 1774, together with a general map on scale three inches to a degree [226].

The first edition of his *Map of Hindoostan* was on the scale of one inch to an equatorial degree; that is, 60 *geographical*, or 69½ *British*, miles to an inch, increased to 1½ inches to a degree for the map of 1788, which was slightly larger than D'Anville's map [214; pls. 6, 13, 14].

Kelly's atlas contains two general maps on the scale of 4½ inches to a degree, and an index map 1¼ inches to a degree. The degree sheets are on the scale of 13½ inches to an equatorial degree, or about 5¼ inches to a mile [242].

Call's atlas of 13 sheets was on the scale of 4 inches to a degree, or 15 *geographical* miles to an inch [216]; Reynolds' province maps were 18 inches, and his general map 9 inches, to a degree.

Colebrooke was the first to adopt a scale of *British* miles for a general map, his *New General Map of India*, started in 1795, being on the scale of 16 British miles to an inch.

PROJECTIONS

Original surveys were protracted from bearing and distance by means of circular protractor and scale; the larger scale maps, and in some cases the general maps also, were laid out either in squares or rectangles; for small scale maps some form of conical projection was adopted, as described by Rennell in his account of the maps sent home in 1774 [226];

> The Projection answers to that of the Plain Chart; the Parallels of Latitude and Meridians making right angles with each other. This was found to answer best for Particular Maps, but in the General Map...the projection is such as shews the inclination of Meridians and difference of Longitude; preserving at the same time the respective positions of places; and of course showing the quantity of Superfices contained on that portion of the Globe which it represents[1].

It is probable that Rennell and other map-makers in India had tables shewing the lengths in inches of degrees of latitude and longitude at different parallels, whilst their scales were given in terms of the equatorial degree; amongst Orme's papers is "a Table shewing how many (British) miles answer to a Degree of Longitude at every degree of Latitude, from Latitude 1° to 90°[2]".

On his map of the Coromandel Coast of 1793–94 [104] Goldingham describes his projection thus;

> The meridian was divided by allowing a degree 60488 fathoms in Latitude 13°, and 60491 fathoms in Latitude 16°.
>
> The Longitude was laid down by allowing a degree in Latitude
>
> | | | | | | |
> |---|---|---|---|---|---|
> | 13° | ... | 59495 fathoms | 15° | ... | 58968·5 fathoms |
> | 14° | ... | 59197 ,, | 16° | ... | 58651·3 ,, |
>
> Both these scales are according to tables constructed by General Roy...and published in Philosophical Transactions[3].

In 1800 Colebrooke projected his map from a table published by Dr. Hutton, professor of mathematics at the R.M.A. Woolwich from 1773 to 1807.

ORTHOGRAPHY[4]

The spelling of place names on English maps of India has remained a vexed question even to the present day, and in the 18th century it was not a matter of complete indifference to all. Spelling was then, however, largely regarded as a

[1] IO. Maps. I. AC. 13. [2] Orme MSS. 65 (1). [3] MRO. Map 125 & MRIO 37 (53). [4] *v.* Markham, ch. XXI.

matter of personal taste, and the precise form even of personal names was not regarded as at all important; we find De Lisle, deLisle, Delisle, de l'Isle, Del'isle, for the great French geographer; we frequently come across "Rennel", who nearly always refers to De Gloss as DuGloss; Mackenzie often appears as McKenzie, whilst Thomas Robertson was so inconsiderate as to change his name to Robinson and back again[1]. It is, therefore, hardly surprising to find the greatest confusion about the simplest of Indian place names.

Jefferys [211] waxes indignant on the subject as early as 1754;

This is surely not a Credit, but a Reproach; which yet a Geographer cannot avoid, who is frequently obliged to follow the corrupt Way or writing Names, first coined in foreign Countries by *Europeans*, and then imported by their Travellers. The only way, however, to shun this Reproach, and remedy the inconveniences attending so shameful a Practice, is to give Exotic words according to their proper Orthography; or, when that is wanting, according to Pronunciation of the natives expressed in English characters[2].

For his map of the Punjab Rennell had the advice of William Davy [233] of whom Markham writes,

The first advocate of any system at all was Major Davy, an officer who studied Persian in India just a century ago. He prided himself on his pronunciation, and was a strong supporter of the phonetic system[3].

The Bombay surveyor Emmitt was abnormally conscientious over his spelling, but not very happy in his results;

As in the names of some places I have ventured to differ from the common Orthography, it may not be unnecessary to account for what might otherwise pass for error.

For instance the well known word Seringaputnam I have for the sake of perspicuity written Sree Rung Puttam, which, in the common speaking of the country, is abbreviated into Seringputtun, or simply Puttan. ...

There is surely a characteristic Idiom in the pronunciation, as well as in the construction, of every Language, & perhaps neither sound nor sense can be conveyed through a foreign channel without some deviation from the Idiomatical nicety of indigenous experession.

The fact is indeed obvious to our daily notice...and our present knowledge of the Oriental Languages teaches us to regret the wide estrangement of proper names throughout our ancient and profane Histories from their Asiatic Origin, whence have sprung obscurities that the industry and ingenuity of the present age is disagreably, and I fear ineffectually, employed in removing.

With these Landmarks before us, It seems peculiarly incumbent on Geographers to be attentive to the right information of the present and future age in the names, as well as the position of places etc.; and though I believe (as perhaps a Frenchman also may) that our pronunciation is as just (and probably more so) to the languages of the East as any other of Europe, yet do our best maps afford ample room for amendment, if we wish to preserve the pure names of the country to erroneous ones, tho' modell'd perhaps more pleasingly to the tympanum of an English Ear, as for instance Nagapatnam and Masulipatnam, instead of Naugputtum, Muchliputtum, and a great many others with which, had I not been already led into greater prolixity than I intended, this subject of remarks might be lengthened[4].

De Havilland writes of his map of Coimbatore [114],

And in writing the names of places, altho' I have attempted throughout to adopt the orthography of the Tameel which appears to me the language, ab origine, of that country; I am sensible, as well from my very slender knowledge of that tongue, as from my being unable frequently to obtain the real names of places written in the language itself, that I have materially failed in this respect[5].

The two great authorities on the subject, whose rival systems were to hold sway for nearly eighty years, were Sir William Jones and Dr. Gilchrist, of whom Markham writes,

The names of Jones and Gilchrist became the watchwords of orthography and orthoepy, of the scientific and phonetic system; and their disciples continued to argue, whilst absolute confusion and anarchy prevailed in the spelling of the general public. For 30 years they had a fair field and no favour; but except among the learned, there was a decided leaning from the first in favour of Gilchrist's system[6].

[1] Markham (384), gives the classic example of "Sir Roger Dowler" for "Suraj-ud-daulah". [2] Jefferys (36). [3] Markham (385). [4] BoS & Pol. 23-11-92. [5] M. Rev. Bd. 12-5-1800. [6] *Markham* (386).

Jones came out to India in 1783 as a Judge of the High Court at Fort William; one of his first extra-official acts in Calcutta was the founding of the Asiatic Society in 1784, and his first presidential address was *A Dissertation on the Orthography of Asiatick words in Roman Letters*.

In the *Manual of Surveying* of 1851 it is written,

Sir William Jones's method is at once elegant and phonical, and is, with slight modifications, in use in the Great Trigonometrical Survey, the rules thus used being,

1st. All vowels to have Italian sound.
2nd. Semi-vowels such as Y to be used as consonants only.
3rd. All consonants as in English, except that C is not used.
4th. The soft G to be always replaced by J.
5th. Dispense with re-duplication of consonants.
6th. Drop superfluous letters where they make but little difference to the pronunciation.
7th. Old established spelling not to be changed.
8th. Double consonants not to be used when the some sound can be represented by a single one.

Gilchrist went to India in 1782 and, devoting himself to philological work nearly the whole of his service, was appointed Professor of Hindustani at the College of Fort William on its foundation in 1800. According to the *Manual of Surveying*,

The Revenue Survey generally followed Gilchrist's system [of orthography], which though simple and rigid, was not based on sound principles[1].

MAPS FOR COURT OF DIRECTORS

The Directors of the East India Company had from the first been most anxious to have all the information they could collect about their possession in India, and not only ordered that surveys should be made as early as possible, but also that copies should be sent home to them without delay [22, 87].

In 1765 when ordering the survey of the Madras *Jāgīr* they also asked the Council,

To send us as soon as finished the said surveys with all the plans and explanations which may be necessary for our fully understanding them [7–8][2].

and in the following year they wrote to Bengal,

A very slight respect has been shown to the frequently repeated Orders given for transmitting Copies of all such [Plans] as have been and shall be made, ... which has only been done of the works at Calcutta[3], and the Survey of Chittagong[4]; yet it has appeared to us that such have been in private Custody here, particularly the Survey of the Calcutta Lands[5]; you will therefore be deemed highly culpable in forbearing to pay the attention due on this important point, by furnishing us with copies of all Draughts, Plans, and Surveys in your Custody, made of our Works, Lands, or of any other kind whatever[6].

and again two years later,

We shall be pleased to receive the Chart preparing by Captain Rennell, but at the same time must observe we think the Charts should be first sent to us, and no Copies given but by our permission, a Rule hitherto unattended to, as Lord Clive & Mr. Vansittart are both in possession of Captain Rennell's Survey of the different Provinces [223][7].

In another letter they expressed themselves even more strongly on the subject;

When a survey is taken no one is to be permitted to take a copy of it, which leads us to repeat our Astonishment at the unfaithful Conduct of our Surveyors, in that they have sent us no one Production of their Labors, tho' they have already put the Company to a very great Expence, which is still going on at the rate of 5,000 and 10,000 Rupees per month, and this neglect is aggravated by our finding that Maps of all the Provinces are in the Hands of Lord Clive and Governor Vansittart. We should have carried our resentment at their conduct as far as dismission, had not the advices by the last Ship assured us the Surveys will be compleated and sent out next year[8].

[1] Thuillier & Smyth (629). [2] CD to M. 24–12–65 (12). [3] The new Fort William. [4] Plaisted's survey [14]. [5] Could this be Cameron's work of 1762-4, possibly taken home by Vansittart [13]? [6] CD of B. 19–2–66 (40). [7] CD to B. 61–3–68 (56). [8] CD to B. 11–11–68 (28).

This was surely somewhat unfair on the surveyors, for to whom else should they deliver their surveys if not to the Governors who had appointed them?

Caraccioli, who turned every thing he possibly could to Clive's discredit, had obviously ample grounds for writing,

> The Directors were kept in the dark by the Company's servants in regard to the acquisitions made in the last war; maps of all the provinces were in the hands of Lord Clive and Governor Vansittart, with a minute description of all the powers who border on them, and an exact estimate of the product and value of the lands, whilst the Directors who employed surveyors at very great expence, could not get the same information [1].

Though the primary reason for the Directors' desire for information may have been purely commercial, there was also the wish to know something about the geography of the country, so as to be able to follow with understanding reports and plans about political and military commitments. In these early years, however, it does not appear that the Directors ever took the initiative towards the improvement of general geography, or the preparation of general maps. This was left to private individuals and professional map-makers, by whom Rennell's earlier maps were published [223, 227].

By 1766 Vansittart had made his peace with the Directors, who ordered

> that Mr. Henry Vansittart & Mr. Alexander Dalrymple be permitted to inspect the several Maps and Charts of the East Indies in the Company's possession, in order to correct and compleat some works of that kind, which when done they intend presenting to the Court [2].

Whilst on the Madras establishment Dalrymple had spent some years trading and exploring in the Eastern Islands, and after his return to England in 1765 he devoted himself to the collection and publication of marine charts. It was undoubtedly at his instigation that the Directors were insistent on calling for copies of surveyors' journals and ships' logs, writing in 1772,

> As we are solicitous to acquire compleat Charts & Maps of the Coasts & Internal Parts of India, by means of such Surveys as have been made thereof, you must not fail to transmit to us by the first opportunity the most accurate copies of the Journals of all such Persons as have been employed at your Presidency in taking Surveys, either by Sea or Land [3].

These orders were repeated on his appointment as Hydrographer in 1779 [45].

Whilst Dalrymple's interest were mainly in nautical charts, Rennell had come home with the particular intention of preparing a general map of India from the records at the India House [212], and it was obviously at his suggestion that the Directors were continually writing, sometimes for copies of particular surveys, and sometimes insisting that all surveys should be sent home.

It has been said that Rennell was appointed Geographer to the East India Company, but no official record of such appointment has been found. Markham says that "He was the unpaid but most efficient head of the Geographical Department of the India House [4]". His position was openly recognised, for Ross, Chief Engineer at Fort St. George, writes,

> The Best Plans of the Southern Countries compiled last war by a number of hands was carried home by Col. Fullarton, who has furnished, with the most liberal readiness, ...the Company's Geographer General, Major Rennell, with all the Documents in his possession. ...
>
> Major Rennell has also had access to the plans and papers of the late Col. Umberstone [99 n. 1], and to other important MSS. which the Company and Public at large have already benefited by, from Major Rennell's second edition of the Memoir and Map of Indoostan, lately published [5] [213].

All surveys that reached India House were placed at his disposal, and his advice was constantly sought. It was obviously at his request that in 1783 the Directors again wrote to both Bengal and Madras urging the collection of geographical material and its despatch to England, concluding,

> We repeat our orders of May 27th 1779 [45] to send copies of...all the general surveys taken since the year 1776, on a scale of 5 British miles to an inch [6]. ...

and again the following year,

[1] Caraccioli. II (392). [2] CM. 19–11–66. [3] CD to M. 25–3–72 (79). [4] Markham (401). [5] Mack. MSS. LXVIII, 1–11–86. [6] CD to P. 15–1–83 (40, 41, 56).

The intention of the orders contained in our letters...respecting Charts, Plans, &c., was that the Company should have in England copies of everything relative to the Geography or Navigation of India that could be obtained, or had been laid down from surveys made at the Company's expence, that we might have all the information possible before us, and that those materials should be secured against any Accident which might deprive the Company of information obtained at so much expence. ... We purposely sent Oil paper [237], with which any person could have traced them. We want exact and not finely finished copies [236]. ... We therefore again repeat our Directions that Copies of all Maps, Charts, plans, surveys, Journals, Routes, or Nautical and Geographical information, not already published, be sent to us forthwith, that you order a Catalogue of all MSS of this Nature, in possession of Surveyors or other officers, to be sent to us in Triplicate, by the earliest conveyances[1].

These orders were by no means welcome either at Calcutta or Madras, for not only did they involve tremendous labour but they also threatened to interrupt the progress of the Surveyor General's own general map [215].

Rennell however was now working on his enlarged *Map of Hindoostan*, and the Directors were insistent, even calling for surveyors' journals and written papers, for copying which there can be no obstruction from want of Draughtsmen. ... We also direct that copies of all the Maps and Plans be sent to England so soon as the same can be done. ...

Oil paper enables any person to trace the outline of the most circumstantial map, and any exact outline will satisfy us; and to prevent any obstruction to the ready execution of our wishes, we have sent by this opportunity some more Oil Papers[2].

They particularly disliked the idea that the Surveyor General should be compiling a general map of his own in India;

We mean that all *Documents be sent to England* (reserving a copy in India to prevent accident), for the very few draughtsmen likely to be in India will be much better employed in making, or copying, surveys and other documents of original information, than in constructing any general maps from such documents, which we mean to have executed in England from all the Materials accumulated here; and, without disparagement to any man's abilities now in India, we cannot but think Major Rennell the fittest person to form a general map[3].

They even objected to Burrow keeping his astronomical observations in India for computation [163].

To reduce the enormous labour entailed by these repeated orders, Wood made the following suggestions in 1792;

I recollect five or six years ago Copies of the Plans in the Surveyor General's Office were alone asked for, the estimated amount of the expence of which...was nearly Twenty Thousand Rupees, ...Amongst the various Plans in the Secretary's, Chief Engineer's and Surveyor General's Offices, not one half of them can ever be of any real Utility, and were it not for the consideration of the little trouble in sending them Home, might as well be destroyed.

I have arranged the Plans in four Classes A, B, C, D.

Class A, may be sent to Europe as soon as possible.

Class B, I would recommend Copies being kept of them, and the originals sent to Europe.

Class C, not appearing to me to be in any respect useful in Europe, I would recommend being kept here.

Class D, are old, ragged, Engraved Plans of no value and may be destroyed.

[I estimate] the cost of copying Plans in list B...about Rs. 2,500. I hope the whole of them may be completed in time to be sent to Europe by the latter ship of the season.

These proposals were approved, and 8 draughtsmen engaged for the purpose[4], enabling the Surveyor General for some years to take copies of new surveys for record and forward the originals to England within a year of their receipt.

The Directors were equally insistent on being sent plans or copies from Madras, where in 1783 the Chief Engineer had to engage a special draughtsman [245]. In 1786 he was again pressed for material, and after pointing out that many of the surveys had already reached Major Rennell [251] he adds, "What still remains in this country I will endeavour to procure, very few having come to the Engineer's office these last 6 years[5]". In acknowledging Reichel's copy of "part

[1] CD to B. 9-12-84 (19). [2] CD to B. 21-7-86 (13, 14). [3] CD to B. 20-8-88 (12). [4] BPC. 13-1-92 (8-10). [5] Mack. MSS. LXVIII, 1-11-86.

of the Cicacole Circar" [93], the Directors say that "the original surveys...would have been more acceptable to us[1]", and in 1791 they acknowledge a box of "30 plans, some of which were not before in our possession", but add that there are still many originals that had not been sent[2].

Topping was directed to "transmit by every Ship, the result of his observations and Surveys[3]", and in reply to his suggestion that other surveyors should submit their work to be examined by him [264], the Directors write,

> We do not concur...that the persons employed in surveys should send the produce of their respective labours to the observatory, there to undergo an examination previous to their being transmitted to Europe, because we do not mean that any collation should be made abroad, but all *originals* sent us, by which we shall be the better enabled to judge of the abilities and dilligence of the persons employed, and obtain that information without delay[4].

They had some difficulty in getting the Bombay Government to send home the surveys collected by Reynolds, who was loth to send any material before his map was ready. In reply to his request that copies should be sent out to him from the collection in London, the Directors ordered that his map should only include his own work [218, 255],

> Nor do we mean that Lieut.-Colonel Reynolds should postpone transmitting to us till his map is completed the surveys he has already made or may hereafter make, but on the contrary that everything done by him as well as by others at our expence, should be send to England as soon as possible[5].

to which the Bombay Government replied that,

> The undertaking was then approaching very fast to its conclusion, in consideration to which we did not insist on that officer's immediately sending home any of his separate surveys, ... since it was...the Colonel's anxious wish to lay the whole of them in one connected view before his employers. ... It would have thrown him back in his final arrangement of his work at least two years, besides occasioning a farther very heavy expence in making the copies thus called for, to an aggregate...of about sixty thousand rupees[6].

CO-OPERATION BETWEEN PRESIDENCIES

The lack of co-operation between surveyors of the three Presidencies during the earlier years of the Company's administration is particularly noticeable, but is hardly surprising when it is considered how remote each presidency was from the other, and how few were the opportunities for contact. Two striking instances may be given.

When Topping, in 1786, travelled from Masulipatam to Calcutta [101-2], he must have travelled the greater part of the way by the same route as had Pearse and Colebrooke during 1784 and 1785 [41-2], and must have made astronomical observations at several of their stations, but he makes no reference whatsoever to Pearse's journey or Colebrooke's survey, and was probably completely ignorant of both.

Colebrooke, in submitting the map he compiled from his surveys made during the campaigns in Mysore of 1791 and 1792 [112-3], makes no reference whatever to the work of Beatson and Allan during these same campaigns; and in the map and memoir which Rennell produced in 1792 to illustrate *the Marches of the British Armies*, acknowledgement is made to the surveys of Beatson and Allan, and none to Colebrooke [111]; indeed it is quite possible that Rennell at that time knew nothing of Colebrooke's work with the Grand Army, for he does not even mention him a year later in the memoir on his map of the South Peninsula [243]. When compiling his map of southern India a few years later, however, Colebrooke did make use of Rennell's compilation [244][7].

The first suggestion that there should be any interchange of geographical material between one presidency and another was made in 1785, when Call was engaged on his atlas of all India. In that year Reynolds had travelled right

[1] ib. 8–4–89 (82). [2] ib. 11–4–92 (24). [3] CD to M. 16–5–92 (16). [4] CD to M. 23–4–94 (65). [5] CD to Bo. 29–5–99 (29). [6] Governor's minute, 16–4–1801. BPC. & DDn. 146 (44). [7] B. Pol. C. 10–7–1800.

across India from Surat to Calcutta, and had promised to send Call copies of his surveys [216]. This was followed up by a letter from the Supreme Government to Bombay,

Our Surveyor General being engaged at present in preparing a General map of Indostan, we request that you will give orders for copies to be taken of all surveys made by Captain Reynolds or now at Bombay, that may be useful to this work, and that the same may be transmitted by your Surveyor to our Surveyor General, who has received instructions to furnish him with copies of such public surveys as may be useful on your side of India[1].

The next year, at Wood's suggestion, letters were again sent to both Bombay and Madras asking for copies of all surveys, as these

would be of the greatest utility in improving a work of so comprehensive a Nature, and, as the object which we have in view is a National one of considerable importance, We request that you will transmit to us, as soon as they can be prepared, and at the least possible expence, copies of all Surveys which may be in your possession of the Sea Coast from Ceylon to the Gulf of Persia, as well as any surveys of Routes, which may have been obtained since the begining of the year 1778, & especially those which relate to the Mysore, and the Mahratta and Travancore Countries, and to the Deccan, of the first of which our knowledge is extremely limited[2].

The Chief Engineer at Madras responded with "a list of all the General plans in this office", and made special copies of "Captain Pringle's Book of Roads, ... together with the General plan of this Part of India[3]", but it was only after more than one reminder that Bombay replied that

the Surveys...are in considerable forwardness, and shall be transmitted as soon as possible, as well as an accurate one of the Sea Coast, which is now prosecuting by the Company's orders[4] [124-5].

This action on the part of the Bengal Government was far from meeting with the approval of the Directors, who wrote out,

We think the orders transmitted to the other Presidencies to send to Bengal copies of the Maps etc. ...may retard their being sent to England. We therefore direct all such copies received at Bengal from the other Settlements be transmitted to us, ...and that in future they be sent directly from those settlements to England. ...

copies should only be made for Bengal *after* the home demand had been met[5].

It was of course only natural that the Governor General and his Council, who were responsible for directing the general political and military policy of the whole of India, should wish to have as complete and up-to-date a map as possible, and during the Mysore War of 1791 Wood obtained their permission to forward to the other presidencies,

extracts from the General Maps, containing such portions of country as were most unknown, and for filling up of which from actual observation opportunities would occur to different Gentlemen, employed on active service with some of the various detachments of your armies, whose combined operations, at this period, comprize a very large extent of country.

These extracts, with their deficiencies supplied, are, at our request, to be returned to us, ...and we trust that the event will fully Justify our Chief Engineer's expectations, by supplying a body of Geographical information which has hitherto been particularly defective as it relates to the Mahratta countries and that of Mysore[6].

As a result of this procedure, copies of all the military surveys carried out in Madras, Mysore, and on the west, reached the Surveyor General after the Mysore war, and facilitated the construction of his map of the South Peninsula [244].

In making these proposals Government had expressed some fear lest their requests should interfere with the rights of surveyors, who

with personal risque and labor, and in some cases at their own expence, had explored countries, and accumulated materials from which they thus acquired the best founded right to future credit as well as pecuniary advantage[7].

Jealousy on this account was certainly felt by Reynolds. In 1797 Colebrooke asked for a copy of the survey made by Reynolds and Blunt in 1793-4 [55];

[1] Bo S & Pol. 7–12–85. [2] BMC. 5–9–86 (7). [3] BMC. 24–11–86. [4] Bo S & Pol. 8–11–87. [5] CD to B. 20–8–88 (15). [6] B to CD 18–8–91 (169-170). [7] ib. (168).

The difficulty of acquiring any Geographical knowledge of countries remote from the Company's possessions has always been very great, but it was in this instance overcome by Captain Reynolds, ...whose activity and perseverance...enabled him...to carry a measured line through the country in question. ...

It is much to be lamented that a copy of so valuable a Survey should not have been laid before Government. ... I beg leave therefore to recommend that an application be made to the Presidency of Bombay for copies of such a portion of Major Reynolds' survey as he took while acting under the particular authority of this Government [1], and had escorts from this Army for his protection [301].

This request was met, and a few months later Reynolds responded by asking for copies of surveys from both Bengal and Madras, though he seems to have anticipated obstruction from Colebrooke's part; rightly or wrongly Reynolds suspected him of being jealous of the Bombay map, even though it was at Colebrooke's request that he had been given permission to copy plans in the Surveyor General's office during his visit in 1793 [217] [2].

The request in my letter...for the copy of papers from Bengal etc...would have been urged before, had I not had reason to expect difficulty in the compliance with it, for from very good authority...I learnt that suspicions had been propogated of a very unjustifiable nature towards me in Bengal, of my intention in prosecuting the enquiry, and of its ultimate appropriation. ... This calumny, from whence its source no matter, whether low or perhaps high, answered the purpose in some measure, and I have felt the effects of it. ...

The authority under which I have been for some time past acting, gave me a right, in my opinion, to expect such communications...which added no credit to myself, took none from other, and they were public papers, copies of which in general had been no doubt already transmitted to Europe; I conceived there could be no just reason for detaining them from me. ...

The map I am about, ...I have reason to apprehend, has laid me open to the envy, jealousy, and secret influence of some of my contemporaries, and had occasioned much vexation to me already. Ignorant as I am, however, of the nature of the reference intended from Bengal, I beg leave to observe, should the idea still remain there of my being backward in my communications, that the nature of the business absolutely requires the final arrangement of my various materials to take place, ...and that any impartial imposition will be a great injustice to me, and can serve no purpose...except to transfer the credit that's my due to some one who may have possibly been most of the time enjoying himself in his armed chair [3].

Reynolds's protests, however served no purpose, for the Directors ordered that he was not to incorporate the work of other surveyors into his map [218], orders that sadly disappointed him;

I read them with much regret, for...in the memorandum I laid before Sir John Shore [in 1793] my proposal to Government was not of a partial nature, but was to complete the whole Geography of India, ...[which] led me to conceive that I might ask for copies of public surveys from the other Presidencies in order to assist my enquiries, and bring the work to a more speedy close, without a suspicion...that I meant to deprive others of the credit of their labours [4].

It is quite probable that all this distrust originated solely on Reynolds's side; he was working alone at Surat, with no assistants, and with no other work than the compilation of his map; he was worried by the Directors pressing for its completion. Colebrooke on the other hand, was at this time engaged in friendly correspondence with Mackenzie, arranging for a free exchange of material between Bengal and Madras, and at the same time passing the remark to Mackenzie,

I should rather think that Colonel Reynolds on the Bombay Establishment would not agree to any mutual communication of surveys, notwithstanding his application for copies of yours [5].

The Governments of Bengal and Madras agreed to this exchange between Colebrooke and Mackenzie, an arrangement which was in due course blessed by the formal approval of the Directors;

The reciprocal communication between your Surveyor General and Captain Mackenzie of the Madras Establishment may tend very much to the improvement of Geographical knowledge, and as this communication is to be made through the medium of our respective

[1] BMC. 15–5–97 (37). [2] DDn. 52 (39), 26–9–93. [3] BoMC. 24–4–98. [4] DDn. 146 (27), 24–12–99. [5] DDn. 14 (66), 23–3–98.

Governments of Bengal and Fort. St. George, we direct that you transmit us from time to time copies of the correspondence which may pass upon the occasion [1].

CUSTODY AND DISTRIBUTION

From the very earliest days, the Directors were insistent that detailed surveys should not be allowed to fall into the hands of the many possible enemies who threatened the Company's possessions during the troublous days of the 18th century. In 1765 they specially asked that Plaisted's survey of the Chittagong River should be kept confidential [15].

They were disgusted to find that surveys were passing into the hands of Governors and senior officers, and being treated as private property, even to the extent of being handed over to map-publishers long before official copies had reached the India House [223, 250–1]. It is even recorded that Rennell's

original surveys...were brought home by some of the high authorities in India, and treated as *private property*, till they were accidently discovered in the collection of a lady of rank, ... and purchased for the sum of one hundred pounds by the Court of Directors [2].

As a precaution, it was recommended in 1768 that,

as the Hon'ble Company have been at a very heavy expence in procuring different surveys in Bengal, ... they be from time to time collected, and deposited under the Governor's care in a public Plan Chest, and a regular list of them to be registered in the Secretary's office [3].

This system appears to have been maintained for some years, for in 1787 the Surveyor General pointed out

the inconvenience of many of the Plans, Routes, and Journals of Surveyors, being kept in the Secretary's office, ...[and asked that] they may all be collected in the Surveyor General's office, or at any rate a list of those retained by the Secretary supplied to the Surveyor General [4].

The Surveyor General appears to have held safe charge of all surveys which reached him and to have issued no copies except to the Governor, but other maps frequently slipped away, especially through commanding officers who thought they had first claim on the work of their own officers. Orme certainly seems to have experienced no difficulty in collecting surveys from his many friends in high places [211]. Closer control was however established in course of time, and the regulations of 1779 threatened the Surveyor General with dismissal if he allowed copies of any map to leave his control without proper authority [262].

In Madras the Chief Engineer was for many years the custodian of maps and surveys, but there were no orders that officers other than Engineers should submit their surveys to him [240]. In his instructions for the survey of the Northern Circārs in 1773 [92], he issued strict orders to the surveyors ;

You are to take particular Care that no one have access to your Plans, and you are not to take, or allow any copies of them to be on any account taken, without the express leave of the Governor and Council [5].

His office was, however, no very secure repository, for he had to report later that,

The loss of plans, and many other inconveniences respecting plans, have arisen from the changes of system that have at different times been adopted, and from orders given by successive Governors for removing plans from the Engineer's office; especially during the Government of Lord Pigot [6], when the plans at the Engineer's office were taken out by a public order of the Secretary, and, in consequence of the Revolution that took place during his Lordship's administration, were suffered occasionally to fall into the hands of a variety of People.

Such a want of arrangement has existed in this respect, that I can venture to assert that Government is now possessed of less materials towards furnishing a complete Chart of the Southern parts of India, than they were at the period of ten years back [7].

[1] CD to B. 7–5–1800 (41). [2] T. B. Jervis, *Bo. Geo. Soc.* IV, 1850 (170) & *Bo. Qy. Rev.* II, 1856 (140). [3] BPC. 30–6–68. [4] BPC. 12–3–87 (20). [5] MMC. 22–3–73. [6] Lord Pigot, with Dalrymple, reached Madras Dec. 1775; arrested by his Council 24–6–76; d. in confinement 20–5–77 [143 n. 8]. [7] BMC. 24–11–86.

An example of such loss of material is given in a letter from the Quartermaster-General of 1807, writing of the Nagari Hills west of Tripasur;

Several of the Pollams were attacked and explored in 1776 by a Detachment under the command of Colonel Kelly [qv], but such geographical information respecting them as may have been acquired has been lost[1].

The Directors took note of Ross's report and sent out strict orders that

to prevent any Plan or Map being, in future, lost or mislaid, as by the Chief Engineer's letter...appears to be the case, the person entrusted with charge of them shall deliver none without the Governor's order in writing, and taking a receipt[2].

Ross still had to report that his lists of maps were incomplete and most confused, and suggested that,

In order that every succeeding officer of Guides may have the means of informing himself of what has been formerly done towards obtaining a perfect knowledge of the country, certain prescribed Times and forms should be established for their reports...to be lodged in the Engineer's office, ... to which officers wanting information can refer as occasion may require; and it would greatly facilitate our researches were the Hon'ble Court to direct the publications of Major Rennell and Mr. Dalrymple to be regularly sent to us.

There is not...in the Public offices copies of any of the Maps or Memoirs which were presented to the Governor General in Council of Bengal by Colonel Kelly [240], and only a few detached reports and one Plan of Captain Pringle's in the Engineer's office[3].

The Directors then ordered that

Mr. Topping be employed to arrange the Register of Maps, as Geographical knowledge is requisite to a proper arrangement[4];

and Madras replied,

we shall pay the strictest attention to your instructions and keep in future the plans &c. in the consultation room, under the care of our Secretary[5].

The Directors were still not satisfied;

As our directions to have all our maps and plans arranged in presses in the Consultation Room, under the Governor's key have not been attended to, we repeat our orders for that purpose[6].

Having seen the Madras maps properly settled at last, we return to Bengal. Shortly before Rennell left the country the Governor General had decided that the Council would be satisfied with one copy of his general map, and that the provincial maps would be more useful if they were distributed to district officers [231]. These 5-mile maps were then sent out to the districts with the following circular;

We herewith transmit you a map of the division superintended by you; and desire the greatest care may be taken of it, as it is to remain a record in your office. We direct that you on no account take any copy, or allow any to be taken of it, and we shall consider your disobedience or neglect of this as a fault highly censurable[7].

Ten years later Wood found that his office possessed no copy of several of these very valuable maps, and tried to call in copies from the district officers;

When I succeeded to the Office of Surveyor General, I received from my Predecessor a variety of different Plans, a list of which I have the honour to transmit you. I have since received some of the Provincial Plans, which, although Lt. Colonel Call did not obtain officially, yet he has been so good as to give them up, to remain in the Surveyor General's office. ...

As many of the Provincial Plans are wanting, and I have some reason to believe this may have been occasioned by former Chiefs and Collectors having obtained the Temporary loan of, and not returned, them, ...I beg leave to submit the following proposal. ... That a circular letter be addressed to all Chiefs and Collectors, directing them to transmit to the Committee of Revenue a list of such plans of their Several Districts as may be in their possession [231][8].

The Collector of Dinājpur, replied to this circular;

At my request the Collector at Purnea some time since forwarded to me the Provincial map of Purnea, Dinagepore, and Rungpore Districts, in order that I might trace the situation of Mudgenoo (insurgent leader of Faquirs) at the time he entered this district; this map

[1] MMC. 4-12-1807; Kelly was unlikely to have sent his work to the CE. [2] CD. to M. 8-4-89 (85). [3] Mack. MSS. LXIX, 31-1-90. [4] C D to M. 11-4-92 (26). [5] M to C D. 5-10-92 (51). [6] C D to M. 23-4-94 (68). [7] BRC. 1-5-76. [8] BMC. 5-9-86 (62).

formerly was in the possession of the Provincial Council, and taken by them to Purneah. ... The necessity for every Collector being furnished with an accurate map of the Division he superintends induces me to request that the map at present in my Possession may remain for the use of the Collectors of Purnea, Rungpore and Dinagepore [1].

whilst the Collector of Sylhet wrote,

I have no plans of this district in my possession, either officially or otherwise obtained [2].

The Surveyor General then noted that,

Complete copies are wanted of all the Provincial Plans, not only for Government, but for the Surveyor General's Office. The only copies have been either mislaid or carried to Europe [3].

Five year later the Surveyor General reports that he has several draughtsmen engaged in copying ten of the Provincial Plans "which had been found in a very tattered state", but that there must be many others which have not yet been found [231];

Should it meet with the approbation of your Lordship, I again recommend that the Collectors of the Several Districts of which the Plans are wanting, to be directed immediately to transmit to the Board of Revenue all Public Plans in their possession, copies of which being taken, the same Plans or Copies of them will be returned them as soon as possible [4].

The following year the Chief Engineer was able to submit 13 of these provincial plans, and that they might not "be lost or mislaid" recommended "that they be placed in charge of the Secretary in the Revenue Department [5]".

From about 1788 the Surveyor General submitted an annual list of the maps held in his office, and in reply to a proposal made by Wood [6] the Directors authorised a special officer for the charge of the drawing office;

The Charge of all Charts, Maps or Plans and other like Documents belonging to the Company should be vested in him, under the directions of the Governor General, and an exact Register made and carefully kept of all particulars, noting how they are at any time disposed of. ... I hope you will be carefull in the choice of the person to be selected for this charge [237] [7].

The following year the Bengal Government had to report,

relative to different plans and charts carried from this country by Lt. Colonels Watson and Call, and other persons, and beg leave to recommend...that they may be recovered to the Company's property, to which they belong [8].

In Bombay the charge of maps and surveys fell naturally to the Surveyor; and soon after Reynold's appointment to this post, the Supreme Government ordered that it is our wish that your Surveyor should keep a Register of all surveys made by your directions, inserting opposite them by whom they were made, and at what time [9].

As Reynolds was constantly out on survey he was not in a position to look closely after maps at the Presidency, where the Chief Engineer was in a better position to do so; when however he settled down at Surat, Government ordered that, it having been customary during the absence of the Surveyor to Lodge all Surveys, routes, &c., in the Chief Engineer's office, the Hon'ble the Governor directs that in future all such papers shall be directed to Captain Reynolds, the Surveyor, & transmitted to his office, from whence he will furnish Government and the Hon'ble the Court of Directors with such papers as may be necessary [10].

Three years later, however, the Commander-in-Chief asked that maps should be kept at the Chief Engineer's office rather than at Surat;

The view of the Commander in Chief in making the present proposal is, first that the surveys may be lodged at the seat of Government, for whose use they were compiled, and secondly, by depositing them with the Chief Engineer, they may be serviceable in instructing the Practitioner. Bombay has no seminary for the improvement of the young Engineer; but he might be advantageously employed for the first year after his arrival in the country in copying these maps.

Government approved this proposal and authorised the Chief Engineer to

employ properly qualified persons...to make such further transcripts as may be required at the rate of four rupees per diem [281] [11].

[1] *Dinajpur, Dist. R.* II (59), 12–10–86. [2] *Sylhet Dist. R.* II (93), 16–10–86. [3] DDn. 16 (18), 1788. [4] BPC. 22–2–92 (17). [5] BMC. 15–2–93 (19). [6] B. S & M. 23–5–87. [7] Colebrooke was duly appointed [237]; CD to B. 20–8–88 (25). [8] B to CD. 5–11–89 (92). [9] BoS & Pol. 1786. From Bengal, 7–12–85. [10] BoMC. 8–12–95. [11] BoMC. 28–8–98.

It must be remembered that this concern for the custody of maps was the more justified since nearly all were manuscript. None of the Company's money was spent on the engraving of maps, and those that were published by Dalrymple, Rennell, or professional map publishers, were engraved at private expence, the utmost contribution from the Directors being the grant of a fixed remuneration to Dalrymple, and the purchase of a limited number of copies from Rennell, with an advance payment [227–9]. No general issue of maps was made to Government servants other than Members of Council; other officers had to purchase them privately.

CHAPTER XVIII

THE SURVEYOR GENERALS[1]

Surveyor Generals of Bengal[2] — *Bengal Regulations* — *Surveyor General's Office at Calcutta* — *Proposals for Surveyor General, Madras* — *Surveyor General, Bombay.*

JAMES Rennell was the first Surveyor General to be appointed in India, his appointment from January 1st 1767 being made under the following resolution of Council, a few weeks before Clive sailed for England;

Mr. James Rennell having, in the surveys which have lately been carried on under his direction, given sufficient proofs of his abilities and assiduity in that branch, which may prove of great consequence to the Company's possessions under this Presidency, It is agreed that he be appointed Surveyor-General, with the rank of Captain, and a salary of Rs. 300 per month in consideration of his merit and the labour of that employ[3] [31].

It has been suggested that Rennell was Surveyor General of India[4], but this is not so. In 1767 the President in Council at Fort William had no authority over any other Presidency except Bengal; such extended authority was not conferred until Warren Hastings was appointed Governor General in 1773, and even then he had no authority for appointments beyond Bengal.

Rennell was *Surveyor General in Bengal*[5].

Having completed the greater part of his surveys and maps by 1774, and being most anxious to return to England on account of ill-health, he applied for a pension. This was granted, after some delay, as a special favour, and he resigned and left the country early in April 1777 [36].

The appointment was then left vacant for several months, until in October the Council appointed Thomas Call, of the Engineers, who had worked as surveyor under Rennell for a short while [33, 35];

We have lately found it necessary to revive[6] the Office of Surveyor General which had remained vacant since the departure of Major Rennell to England, ... and Lieutenant Call having been recommended to us by the Governor General, as qualified for discharging the duties of this office, he has accordingly been appointed to it[7].

The appointment dated from October 7th 1777, but the Directors did not at once confirm it, and the following year appointed William Richards[8] who had been assistant to Rennell for several years, and had left India on account of his health at the end of 1776. Richards, however, never returned to India to take up the appointment, which he eventually resigned in 1781[9].

Call continued as Surveyor General till 1786, when he resigned on February 6th to become Chief Engineer;

Having completed my Map of India as far as the Materials in my possession will enable me to do, I humbly beg your permission to resign the appointment of Surveyor General. ...

My motive for wishing to give up my appointment, is that I may be able to apply myself to the studies of my profession as an Engineer, and that I may be at liberty to pursue such other services as my Superiors may think proper to order me on.

Captain Mark Wood is well qualified to fill the appointment of Surveyor General, and being the next Officer to me in the Corps, I take the liberty to mention him as a proper person to be appointed in my stead[10].

[1] This form of plural was accepted by Sir. Sidney Burrard, 27–10–1914; SGO. 111–1923. The hyphen is not here used in India. [2] James Rennell, Jan. 1767 to April 1777; Thomas Call, Oct. 1777 to Feb. 1786; Mark Wood, Feb. 1786 to Nov. 1788; Alexander Kyd, Nov. 1788 to Feb. 1794; Robert Colebrooke, Feb. 1794 to Sept. 1808. [3] BPC. 8–1–67. [4] eg. La Touche (Titlepage); Hirst & Ascoli (i, 49). There was no SG. of India till 1815, when Mackenzie was so appd. [5] *Memoir*, 1788 (Titlepage). [6] Written "revise" in extant records, an obvious copying error. B to CD. 21–11–77 (82). [7] CD to B. 23–12–78 (148). [8] CM. 23–1–81. [10] BPC. 7–2–86 (14).

Wood was duly appointed from the following day, February 7th, and during the time he was Surveyor General continued "Commanding at Budge Budge", even submitting estimates for the construction of barracks there. On November 15th 1788 he, in his turn, was appointed Chief Engineer, and on the same date

Captain Alexander Kyd is appointed Surveyor General and commandant of the Fort of Budge Budge in the room of Lt. Colonel Wood[1].

Both Wood and Kyd were Engineer officers, Wood having made surveys of Calcutta and the Hoogly River [50, 53–4], and Kyd a reconnaissance of the Arakan coast, and a survey of the island and harbour of Penang [46–7]; in both cases their selection to be Surveyor General seems to have followed from their standing in the corps.

During his term of office Kyd spent very little time at Calcutta; he spent season 1789–90 on a survey of the harbours of the Andaman & Nicobar Islands [48–9], and from November 1790 till July 1992, was A. D. C. to the Governor General, Lord Cornwallis, on the campaign in Mysore, retaining in the field his office of Surveyor General [43, 112–3].

In February 1793, he was sent to the Andaman Islands as Superintendent, leaving his assistant Colebrooke in charge of the Surveyor General's office [49-50]; he continued to hold the post and salary of Surveyor General till he resigned a year later;

It is my wish to have permission to resign the Office of Surveyor General.

I am induced to make this request from the little prospect that there is, owing to my present public occupation, of being at all able to attach myself to the duties of an office that particularly requires constant and unbroken attention, and from a conviction that they will be executed with much more advantage to the Public were it entirely under the management of a qualified person, whose mind may be wholly engaged in Geographical pursuits[2].

Colebrooke was appointed to succeed him from February 8th 1794 [8, 268];

The Governor in Council thinks it proper to observe upon this occasion that although the seniority of appointment among the assistants in the Surveyor General's Office is with Lieutenant Wilford, who has been for a long time on a Surveying Duty in the Zamindary of Benares, yet as Lieutenant Colebrooke is Senior to Lieutenant Wilford in the list of the Army, and very competent, as indeed Lieutenant Wilford also is, to the Duties of Surveyor General, the choice has fallen where the Order plans it[3].

Colebrooke's was a fitting choice as he had spent the greater part of his service on survey. He had first learnt his profession as surveyor to the Bengal Detachment under Pearse between 1783 and 1785; he had accompanied Kyd as assistant surveyor both to Penang in 1787, and again to the Andaman & Nicobar Islands in 1789–90. He had made surveys on the march with his regiment in the Upper Provinces, and in 1789 had been appointed assistant in charge of the maps in the Surveyor General's Office. He had been on survey during the 1791–92 campaigns in Mysore, and remained a keen and active surveyor throughout his term as Surveyor General, dying on tour, September 21st 1808.

BENGAL REGULATIONS

The earliest regulations for the Surveyor General's Department in Bengal were laid down in 1779, and amongst the more interesting are the following;

That he [the Surveyor General] furnish Surveyors employed in different parts of the country with orders and instructions. All surveyors sent with detachments are to receive their instructions from the Surveyor General. ...

He will compile such routes and observations as may be made, and reduce and insert them in his general plan [215].

He is to supply the Commander in Chief with such routes as he may deem necessary.

He is to furnish the Board and Commander in Chief with alphabetical lists and military descriptions of the Roads through India [230], specifying the distance from each town, and observations on the roads, forts, passages of the rivers, in the different seasons of the year,

[1] BGO. 26–11–88. [2] BPC. 7–2–94. [3] BPC. 8–2–1794 & B to CD. 14–2–94 (33).

with the boats and materials for embarcation procureable in the neighbourhood; proper places of encampment for food and water; market places and grain and bullocks; natural strength of the ground.

That the Surveyor General shall not furnish, on pain of suspension or dismission from his office [256], to any person whatever, copies of any maps or plans of the country and posts, march routes, or information relating to the surface of the country, without an order in writing from the Board or the Commander in Chief. That he require from the surveyors that have acted under him all original plans and surveys, ... with a declaration in writing on honour, ... that they have not retained any of the original matters of which they were compiled.

That he be responsible for the Assistants in his Office, so far that he employ none without large security for their fidelity [236].

That the Surveyor General make Quarterly Returns to the Board, specifying the different plans in his possession, as also the progress he has made in forming new ones; such returns shall also specify what surveyors are employed under him, on what duty, and the progress respectively made by them, their fitness for the service, and the good or bad execution of the plans furnished by them.

That the Surveyor General obey all orders from the Governor General and that he continue to receive his instructions for surveys from the Governor General as heretofore[1].

Up till 1785 the Surveyor General and his staff belonged to the Civil department, but on the formation of the Military Department of Government, they were transferred to that department.

SURVEYOR GENERAL'S OFFICE AT CALCUTTA

Rennell made his headquarters at Dacca[2], and we do not find any claims from him for an office building, or office rent, nor for any office establishment, which appear to have been covered by the full field allowances which he drew throughout the year [274].

After he left, the Surveyor General maintained his office at Calcutta, where it has remained to this day.

By a resolution passed in August 1799, the Surveyor General was allowed Salary, Rs. 651; House Rent, Rs. 400; Draftsmen, Stationery & Charges of Office to be drawn by the Actual Charge, but limited to Rs. 600 p.m. [235]...

But shortly after this, ... on 11th October 1779, that order was revoked, and the Surveyor General's Bill's for Draftsmen, Stationery, and charges of Office, were directed to be delivered upon Honor, not as a fixed charge, but varying monthly according to the occasions of his office, and in consequence of this resolution...a charge not variable, but fixed, ... was regularly drawn until 31st March 1785.

Harcarrars, Sickligurs [290 n. 6], Peons, Moonshies and Interpreters [289]	Rs. 100
Stationery, Oil, and Candels, ...	120[3]

In 1788, after the retrenchments of 1785, the establishment was fixed at,

Office Rent per month	Rs. 90
One native writer	50
Followers	44[4]

Living in Calcutta was far from cheap, and in 1793 Government found it necesary to order that,

After 1st of next month, no uncovenanted assistants, or writers, whether European, Portuguese or Native, on monthly pay, or paid by the section, shall do duty in any two or more offices[5].

In 1794 the Surveyor General addressed Government from Chowringee [168];

The allowance of Rs. 90 for an office is not adequate to the Expence I have incurred. Not being allowed quarters in the Fort I humbly conceive I might, in the article of House or Office

[1] BMC. 5-8-79, & Carroll's Code, Ch. VIII. [2] Both Century Series & Hunter (73) say that Rennell "kept a staff of draughtsmen in Calcutta". No corroboration has been found, though he spent several months in Calcutta during the rains of 1767-69. [3] BMC. 9-8-79 & BMC. 24-11-86. [4] BMC. 10-6-88. [5] MRIO. M. 574. 25-2-93.

rent, be put upon a footing with other Heads of Offices, and with the Secretaries to the Military and Hospital Boards, whose allowances are each Rs. 250.

This is the exact sum I have expended for many months past for the House I inhabit, and I am pretty certain I could not accommodate myself at a cheaper rate without retiring to such a distance from Calcutta as would render it impracticable for the Draftsmen to attend, or living in some remote and obscure corner of the Town[1].

The application was refused.

PROPOSALS FOR SURVEYOR GENERAL, MADRAS

Although the surveyors of the Madras Presidency were as worthy of note as those of Bengal, and their labours equally appreciated, yet until 1810 the Company firmly refused to appoint a Surveyor General to that Presidency.

The first suggestion of the need for such a post was made in 1775 by Ross, the Chief Engineer, with reference to surveys in Masulipatam;

As the surveys now wanted are very extensive, I would propose that as many gentlemen as can be got be employed thereon, and that the whole be under one Surveyor General, who should appoint the most capable to the direction of the different districts and the others to act as their assistants, until properly qualified to take a charge upon themselves.

He should manage the correspondence and direct their proceedings, so as the whole may agree when completed[2].

The detailed scheme which Kelly put up in 1779 [97] covered an establishment of two sub-directors, two assistant surveyors, four draughtsmen, thirty native non-commissioned officers and men, fifty lascars and coolies, "to be generally employed in separate parties thro' the country", together with an adequate supply of telescopes, quadrants, sextants, theodolites, plane-tables [193], and other surveying instruments. He asked for no administrative charge for himself other than the duty of compiling the maps;

The nature of the business points out an office for which, as I have no competitors, I will venture to apply, not without hopes of success; I mean that of Geogrpher to the Hon'ble Company. This is a post for which I have long laboured to render myself qualified, and in which I think I can render myself useful[3].

and again to the Supreme Government in 1782 [240–1],

The part I should wish to act in the business myself...should be that of Geographer, not only because I wish not to interfere with the appointments of other Gentlemen, but that I could always employ myself that way, without neglecting my other duties as an officer[4].

Kelly's proposals were referred home both by the Madras and the Supreme Governments, but the Directors, dreading any increase of expenditure whilst so heavily involved by the Marātha and Mysore Wars, and gave an emphatic refusal to both[5] [240].

They were equally firm when Ross suggested in 1783 that, to meet their call for increased activity in surveying [101, 251–2]

a Corps of Surveyors should be selected and put under the Orders of a Surveyor General, to whom Government should give the entire charge[6],

answering,

We do not by any means approve of your intentions, grounded on the Engineer's report, for establishing a Surveyor General, which would draw the Company into a great and needless expence[7].

In 1792 they expressed their appreciation of Topping's abilities;

As Mr. Topping has been actually employed so long in surveying, and in Astronomical Observations for the Company, we think it proper to appoint him our Astronomer and Surveyor on your Coast. ... We direct that all Surveys be made under his directions; we do not mean to extend his Authority as Surveyor...over Engineers or Military Officers employed with the Army or Detachments, but over all Persons, Civil or Military, employed especially in actual Surveys or Astronomical Observations, and all the Instruments are to be under his Charge.

[1] BMC. 14–3–94 (14). [2] Mack. MSS. LXVIII, 29–5–75. [3] MMC. 16–8–79. [4] BPC. 27–5–82. [5] CD. to M. 18–10–82. [6] MPC. 28–10–83. [7] CD to M. 9–12–84 (16); CD to M. 16–5–92 (14).

To get his responsibilities more clearly defined, Topping submitted that
in order to render these intentions effectual, and my exertions as *extensively useful* as possible, it will be necessary for me to be made acquainted with the present state of surveying in this country, and to have entire access to the maps and charts that have been constructed from time to time by different persons: The Hon'ble Board will, I presume, see the propriety also of apprizing such gentlemen as are, or may be, employed throughout their establishment in making surveys, or taking astronomical observations, that they are in future to make their reports to me.

...The Hon'ble Board will perceive it to be a part of the orders they may have sent me that *all the Instruments are to be under my charge*[5].

Government accepted these suggestions and desired the Chief Engineer to
put Mr. Topping in possession of all the surveying instruments under your charge, and permit him to have free access to the maps and Charts in your Department.

Topping further proposed,

That all persons who may be employed in surveying, (with exception only to...the restrictions specified) be directed to take their instructions from me; to report their proceedings, and finally to send the produce of their respective labours to the observatory, there to undergo an examination previous to their being transmitted to Europe [253].

Besides the *personal labours* of a practical surveyor; and the duties of an astronomer the Honble. Company evidently expect from me, ... the more extensive services of a *Surveyor Ganeral.*

But in doing this, they do not clearly appear to have given me the *fixed* appointments. and *titular character* usually annexed to so responsible a station; I hope however that this state of incertitude will not impede my exertions in the Public service.

On this the Council resolved
to recommend to the Court of Directors the adoption of the regulations proposed...and to point out to them the necessity of defining the authority they meant should attach to Mr. Topping's station[2].

Later in the year, when recommending an establishment of surveyors for a Department of Tank Repairs, Topping repeated his suggestion that a Surveyor General should be appointed [108], and the Directors replied appointing him "the Company's Astronomer, Geographical and Marine Surveyor-in-chief under your Presidency[3]".

After Topping's death early in 1796 Mackenzie applied to be appointed Surveyor General;

To...render the several surveys carried on under the Presidence of real use, by bringing the whole under one regular systematic arrangement (as is already the case in our neighbouring Presidency of Bengal), I beg leave to submit...the expediency of appointing an office of Surveyor General for the purpose of superintending and directing all surveys made by order, under this Presidency, for examining and reporting their progress, and for suggesting such further improvement as may be expedient. ...

The office of Surveyor General being for some years established in Bengal, it is supposed that adopting the same plan on the Coast would facilitate a ready communication on these subjects between the several branches of our Government in India, and promote the acquisition and improvement of General Geography so useful and honorable to the British interests.

On this Government resolved
that Captain Mackenzie's application for the appointment of Surveyor General on the Coast, be recommended to the favourable consideration of the Honorable Court of Directors[4].

but the only response was that
your recommendation of Captain Mackenzie will be attended to when the expediency of appointing a Surveyor General comes under consideration[5].

The following is taken from a letter written by the future Duke of Wellington to his brother Henry, Private Secretary to their eldest brother the Governor General, Lord Mornington[6]. Arthur Wellesley was at this time commanding the troops in Mysore, and a member of the Mysore Commission for which Mackenzie had been preparing maps [119];

I enclose you a letter I received from Mackenzie immediately after his departure from hence, and I shall be obliged to you if you will show it to Mornington. I refer you to Webbe[7]

[1] MPC. 13-11-92. [2] MPC. 30-3-93. [3] CD to M. 23-4-94. [4] MMC. 6-9-96. [5] CD. to M. 23-5-98.
[6] GG. 1798-1805, becoming Marquis Wellesley. [7] Josiah Webbe, Writer, 1783; Sec. to Govt.

for all the particulars relating to his claim to be appointed Surveyor General. It appears to me very necessary that there should be such an officer upon the local establishment. Hitherto, whatever may have been the merits of the Surveyors employed, or the excellence of their works, the Government have derived no benifit from them for want of the office of the Surveyor General where they might be examined and arranged; and the fact is, that excepting of the jaghire and the survey lately made by Mr. Mather of the Barahmahal, the Company have no survey of any part of the coast, notwithstanding that officers have been employed and paid at different times to survey every part of the Carnatic and of the Circars[1].

SURVEYOR GENERAL, BOMBAY

The presidency of Bombay differed from its sister presidencies of Madras and Bengal, in that it had no territories of any extent to administer until the acquisition of Malabar in 1792. A few routes had been surveyed during operations against the Marāthas between 1772 and 1782, and Reynolds had been Surveyor General to the army that met disaster at Bednur in 1783 [125].

From 1785 Reynolds was "Surveyor on the Bombay Establishment [273, 282]", and three years later the Bombay Government wrote home,

As we are of the opinion that the appointment of a Surveyor General at this Presidency would be of great utility, we beg leave to recommend the institution of such an office to your consideration, and that, should it meet your concurrence, you will be pleased to appoint Captain Reynolds thereto, who has eminently distinguished himself in that branch of Science[2].

This letter crossed one in which the Directors wrote,

An application has lately been made to us in behalf of Captain Charles Reynolds...that he may be appointed Surveyor General under your Presidency. Although we entertain a very high opinion of the abilities of Captain Reynolds, ...yet we cannot yield to the present application in his favor by appointing him Surveyor General, the same being a new office[3].

Reynolds had to wait until January 1796 before he became Surveyor General on the Bombay Establishment[4], and then held office until his resignation in February 1807.

[1] Supply. Desps. I. 2–8–99. [2] Bo to CD. 6–1–88. [3] CD to Bo. 21–11–87 (8). [4] No order creating this appointment has been found. In a resolution dated 8–12–95, Reynolds is designated Surveyor; in all subsequent correspondence he is designated Surveyor General.

CHAPTER XIX

SURVEYORS

Recruitment — Conditions of Service — Civil & Military Surveyors — Surveyors "Out of the Service" — Rennell's Surveyors — Other Bengal Surveyors — Madras Surveyors — Bombay Surveyors.

THE great majority of surveyors in India were military officers drawn from the Company's troops. Before 1760 these military forces were few, and there was no difficulty in obtaining sufficient cadets by nomination in England or in India. Some, like Clive, actually started as civil servants and it was then possible for a writer in the Civil Service to hold a military commission, and receive promotion in both services. There was no provision that cadets should have had any special education or training before appointment.

After 1760 there was a rapid increase in the strength of the Company's army, especially in Bengal where the acquisition of great territories involved the Company in frequent struggles along and beyond its frontiers.

The greater part of the army was Infantry, mostly Sepoys, with one or more battalions of Europeans at each Presidency, and a few companies of Artillery each having on its strength at least one officer qualified as an engineer; these were the first military engineers; the early civil engineers and Surveyors of Works did not hold military commissions.

Separate corps of military engineers were formed, in Madras from 1759, in Bengal from 1761[1], and in Bombay from 1768[2]. Service in the artillery and engineers was not at first regarded as "in the military line", and their officers were not allowed command over other troops, nor a share in prize money; service in the infantry was often more popular, and brought better pay and prospects[3] [272].

From 1765 a few cadets were obtained from the Royal Military Academy at Woolwich, but these did not necessarily join the scientific corps; it was not until 1798 that the Company was allowed to place a few boys at the R.M.A. to be educated for their artillery and engineers. The R.M.C. at Marlow was founded in 1802.

Cadets came out to India, sometimes as young as 14 or 15, and then waited for a commission until there was a vacancy; during the Rohilla War of 1773-4 a corps of 100 such waiting cadets took part in the campaign as a *select picket*.

Conditions of Service[4]

Civil officers came out with first appointment as Writers and then rose as Factors and Merchants to be Senior Merchants. The senior merchant at one of the early *Factories* was designated the *Chief* of that Factory. The senior civil officer of a province or district was called at various periods *Resident*, *Supervisor*, or *Collector*. For some years there were *Provincial Councils* at Murshidābād, Patna, Chittagong, and other settlements, each with their *Chief*.

On receiving his first commission, a military cadet received, as a rule, the junior rank of his corps; for cavalry *Cornet*; for infantry and engineers, *Ensign*; for artillery, *Fire-worker*. Besides their military rank, engineers were graded professionally as *Practitioner-Engineer*, *Sub-Engineer*, *Sub-Director*, and *Director*. The

[1] When Polier took charge of the Works at Ft. William in 1762, he had only two assistant engineers, Huygens & Adams; B to CD. 30-10-62 (63). [2] Not finally separated till 1775; Bo PC. 21-7-75. [3] v. Bio. Notes, Maclean, Montresor. [4] Hodson (preface) & Addiscombe (1).

senior engineer at the Presidency, or with a field force, was called *Chief Engineer*, regardless of his grade.

For all corps there was a rank of *Captain-Lieutenant* intermediate between *Lieutenant* and *Captain*, which was abolished for Engineers in 1809, and for others in 1819.

Mrs. Kindersley wrote from Allahābād in 1767,

> The army is at present divided into three brigades; each brigade consists of one battalion of ten companies of European infantry; ...one regiment of ten battalions of seapoys [200 men to a battalion]. ... Every battalion has an English captain, ...and the whole regiment of seapoys has field officers, the same as a battalion of Europeans. ...
>
> The artillery is one regiment of four companies; ...one company of artillery is attached to every brigade. ...
>
> There are besides, the three brigades, some battalions called *Purgunna Seapoys*, commanded by English officers; these are a sort of provincial troops, being under the direction of the chiefs of the English factories [1].

Infantry officers were frequently transferred from one battalion to another, and the numbering of the battalions was liable to change at every re-organization of the army.

There were no pension rules until 1793 and no furlough before 1796. Any officer wishing to return to Europe had to resign the service, usually receiving no pay whilst thus absent, though he might be re-appointed and permitted to return to India. The regulations of 1796 allowed furlough for three years. Officers were allowed to proceed oversea on medical certificate without surrendering their appointments, provided they did not go west of the Cape.

The conditions of life in the east were so severe that Rennell has been quoted as saying that of the young Englishmen who come out to India "scarce one out of 70 men returns to his native country" [2].

CIVIL & MILITARY SURVEYORS

Though there was no training school for surveyors, officers with some elementry knowledge of survey were generally to be found when wanted. Officers with previous experience, or talent, were soon found out, whatever their corps, and every engineer officer was presumed to be capable of surveying [182, 270].

In reply to one of their earlier demands for surveys the Bengal Council wrote to the Directors,

> We beg leave to recommend it as a measure well worth your attention, the keeping your Corps of Engineers constantly supplied with young gentlemen properly instructed in that particular branch [3].

and the Directors replied,

> As we send out several young gentlemen for the Artillery who have been educated at the Royal Military Academy at Woolwich, we would have you employ such of them in the Surveying way as show a talent for that branch [4].

The following table gives a rough analysis of the Company's servants employed on survey in the three Presidencies during the 18th century, about half of whom might be considered as efficient surveyors. The table does not cover every officer who ever made a sketch or survey or observed a latitude.

	Mariners	Medical	Civil Servants	Engineers	Artillery	Infantry
Rennell's surveyors ...	1	...	...	7	...	2
Bengal, excluding above	2	2	2 (including a Chaplain)	23	5	39
Madras	...	...	11	14	2	9
Bombay	3	...	1	5	6	4
TOTAL ...	6	2	14	49	13	54

[1] Kindersley (208–9). [2] Ursula Low (68). [3] B to CD. 30–3–67. [4] CD to B. 16–3–68 (56); For many years Engineer cadets were sent out to Artillery and posted to Engineers after a test in India; *Addiscombe* (1).

Perhaps the most noticeable features of this table are that in Bengal half the surveyors were Infantry officers and in Madras the Civil Servants took a large share in the surveys; for the purpose of this table the skilled surveyors Barnard and Cotsford have been classed as civil, though they started service with commissions as engineers as well [272].

Colebrooke was the first Infantry officer to become Surveyor General, and his professional qualifications were undoubtedly superior to those of the three Engineer officers who immediately preceded him.

Two civil servants made outstanding contributions to Indian geography, both of them as geographers and not surveyors; Dalrymple, who spent several years exploring the far east, and went on to be Hydrographer to the East India Company, and then the Admiralty; and Orme, the great historian, who never ceased his demands for maps and yet more maps and, like Dalrymple, did not remain content with the mere collection of surveys, but had them engraved and published.

SURVEYORS "OUT OF THE SERVICE"

When in 1768 the Paymaster General put up proposals for surveyors' allowances [275], he added,

> You will observe, Gentlemen, that we have made no provision for such Surveyors as are not in the Company's Civil or Military service, because we are of opinion no person should be entrusted with Inland Surveys, except those who are actually in the service[1].

But in spite of this narrow view there were many notable men outside the Company's civil and military services to whom all the early geographers of India have been indebted. First the Jesuit missionaries, the pioneers of scientific work, astronomical observations, and early maps. Then the French leaders, Bussy and Law, who, though possibly not actual surveyors themselves, kept up the most valuable maps of their travels. There was the parson William Smith, not only an ardent astronomer, but a practical surveyor as well, and the rolling stone Thomas Motte, always ready to take up any task that would bring him a living.

There were the Hanoverian soldiers, Schlegel, Wersebe, and du Platt, who obviously welcomed their surveys and map-making as a relief from regimental duties. There was the uncouth genius Reuben Burrow, who spent his early years as mathematical teacher and compiler of almanacs in London, and escaped to the East to absorb himself in Sanscrit and Hindu learning, doing perhaps the most valuable work of his life in covering Bengal with reliable fixed points, carrying on till his health broke down and a lonely death overtook him in his budgerow on the river.

There was Michael Topping, a man of the sea, who was undoubtedly the most talented surveyor who had yet reached India, neglecting no scientific precaution to keep his work up to the highest standards of the time, with the vision and strength of purpose to establish the Company's first astronomical observatory, and a training school to turn out a useful body of professional surveyors. And to Topping's credit also may be put the "young man John Goldingham", whom he brought in as assistant astronomer, and left in charge of the observatory.

And then there was the Master of Arts from Aberdeen, John Mather, who reached Madras after being several times ship-wrecked in the eastern seas, and for over 12 years did steady reliable work, Mackenzie's most trusted assistant. His health broke down completely and he was allowed to return home with a pension, only to find his final rest, drowned at sea, almost in sight of the English shore.

Two surveyors of a different walk of life were Edward Tiretta, Italian, civil architect and surveyor of Calcutta, and Aaron Upjohn, who travelled out to India as a bassoon player in a ship's band. Both of these made large-scale maps of part

[1] BPC. 4–7–68.

of Calcutta, and Upjohn, a capable draughtsman and surveyor, spent an exciting season beating along the Chittagong coast in a small country ship, only to return to his death in Calcutta.

RENNELL'S SURVEYORS

The Council at Fort William fully realised the need for the survey of the territories which they had acquired in 1757 and 1760, but it was some time before they found the men for the work. Plaisted proved the ideal man for the survey of the sea coast, and Hugh Cameron, discharged from the Bombay service, was discovered for the survey of the 24-Parganas. The engineers Amphlett and Polier found time to make rough surveys of the rivers and roads between Calcutta and Murshidābād, but up to the end of 1764 the army was engaged in vital struggles on the western frontiers, and officers could not be spared.

The arrival of Rennell with the testimony of his naval friends as to his skill with quadrant and chain came at a most opportune moment, just after the death of Cameron. De Gloss, from the Bombay Artillery, had answered the call for officers, and as soon as he could be released from military duty after the battle of Buxar, was put on to the survey of Burdwān.

Each Governor in turn, Vansittart, Clive, Verelst, Cartier, and Hastings, was eager to push on the map-making, and none hesitated to exercise his patronage to nominate likely young men for the work. When he first gave orders for a general map of Bengal, Clive wrote to Rennell, "if you have occasion for any assistants, name them, and I will order them to attend you[1]" and Ensign Richards of the Engineers was sent up at once to join him [22]. The following year Adams and Huygens of the Engineers were sent out on surveys, as well as Lady Clive's "most deserving" relation, Thomas Carter.

On his appointment as Surveyor General, Rennell was given the services of Richards, De Gloss, Adams and Carter, and when submitting his maps he said that they incorporated the work of ten surveyors (Adams having died in 1767); De Gloss, Richards, Rennell, Huygens, Carter, Portsmouth, Call, Martin, Russell, and Ritchie [33]; whilst he mentions several others whose work he used for the small scale general maps [226 n. 6].

Of these ten, Carter and Martin were Infantry officers, Ritchie succeeded Plaisted as Marine Surveyor, and the rest were Engineers.

Claud Martin was the Frenchman who afterwards took service with the Wazīr of Oudh, and is well known for the huge fortune which he accumulated, and the bequests which he left for the foundation of schools. Portsmouth died in 1767, and Carter, Martin, Richards, and Ritchie, were the only assistants to remain on survey for any length of time.

In 1774, after Rennell had submitted his maps, Government ordered that all surveyors should be withdrawn, but two years later, when he pointed out the existence of certain gaps, he was allowed to take on a few surveyors for three or four months and to select them himself. Though the appointment of surveyor was much sought after because of the allowance which it carried, there were not many who were properly qualified, and Rennell did not find it easy to find suitable officers;

> At present I cannot fix on any person for conducting the surveys in Delhi and Agra; and I await an answer to an application I have made to the Commander in Coos Beyhar, before I can appoint any person to that survey[2].

Andrew Pringle had recently got into trouble and had been removed from the survey of Jungleterry by order of the Supreme Council [35, 295]. Rennell now asked for his services again, saying,

[1] Malcolm, III (162); Clive to Rennell, 4-10-65. [2] BPC. 5-12-76 (3).

I find it extremely difficult to get persons properly qualified for this service; ... I am now at a loss to fix on a person of ability, Joined with sufficient local knowledge in that country.

The Commander in Chief, General Clavering, objected strongly to Pringle's re-employment, saying, "There are many other officers who would be glad to get the appointment, and are equally or better qualified for it", but Hastings shewed a personal interest in the matter and supported Rennell;

I have a good opinion of Mr. Pringle's abilities as a surveyor, and consent to his being employed in that character on any service, provided it be not in the Jungleterry District.

It was not often that there were enough officers available to allow of two surveyors working in company, though a beginner was sometimes attached to an older surveyor for a short time. In 1767 Adams mentioned that Portsmouth was lately his assistant, and in the same season Carter had both Russell and John Cameron with him on survey in Rāmgarh. Rennell had greatly appreciated Richards' company in the early days, and was now anxious to provide assistant surveyors for the more distant areas,

as it will be requisite that the Surveyor appointed to conduct the Surveys in Oude, Ellahabad, &c. should have an Assistant with him, that in Case of Illness or Accidents, the Surveys may not be delayed[1]; ...

and again,

As the probable length of Mr. Ranken's Survey in an unwholesome country may expose him to sickness, & a considerable expence unnecessarily incurred, I beg to recommend the need of appointing a proper person to accompany him; at present in the capacity of assistant; and if need be, to take charge of the survey. Lieut. Dodsworth of the 6th Battalion stationed at Chittra in Ramghur has been represented to me as a proper person, and being on the spot all contingent charges and delays will in consequence be avoided[2].

OTHER BENGAL SURVEYORS

After Rennell's departure the chief opportunities for survey came from the marches of military detachments or political missions through unknown country; where an engineer officer was available he was generally detailed to make the survey, as in the case of Goddard's march to Bombay, but very often some suitable infantry officer was found. A particularly important selection was that of young Colebrooke who surveyed Pearse's return march from Madras, and devoted himself to survey for the next twenty five years.

The large scale surveys of towns and cantonments was regarded as the particular business of the Engineers, and Wood and several others spent two or three seasons on the survey of Calcutta and its neighbourhood between 1782 and 1785. In 1785, however all such surveys were closed down on account of expence [38].

In 1783 the Chief Engineer, Henry Watson, obtained Government sanction to start a school of mathemetics and astronomy for young engineer officers stationed at Fort William, and proposed Reuben Burrow as instructor [157]. In making his proposals Watson writes,

Surveying is much wanted to be known, even to those Gentlemen of the Corps who have had the most experience and are best qualified, for altho' several must certainly possess a competent knowledge to make a correct survey of a small District, none are yet perfect Masters, or able to determine with precision the Longitude and Latitude of Places, and therefore unable to perform extensive Surveys with the requisite exactness.

This useful Branch of learning is more particularly necessary for the Corps of the Engineer in this Country, than it can be even said to be in Europe, where Mathematical and Astronomical knowledge is not sought for from any one Corps or Body of Men, but from a nation at large, when great and Extensive Surveys are required to be executed,

The general want of this Branch of Science in His Majesty's Corps of Engineers, even with all their advantages, is well known. ... But, Exclusive of the great Benefit that would

[1] BPC. 5-12-76 (4). [2] BPC. 28-10-76 (17).

result from establishing the knowledge, and by rendering the Theory and Practice of it familiar to the Corps when employed in these Provinces; Government may then at all times be assured of having a number of Officers properly qualified for undertaking Distant Nautical Surveys, which I believe are more wanted to the Eastward of Bengal than any other part of the Globe, where such extensive Branches of Commerce are daily carried on.

I am the more anxious about the Establishment which I have presumed to recommend, from a perfect conviction of the great want of the Mathematical Learning in the Corps, and of the very great utility that would certainly result from the attainment of such knowledge [1].

Burrow was duly appointed, but three years later was called off for his astronomical survey, and the engineer officers lost his regular instruction. It is doubtful whether his teaching had much effect in promoting the cause of Survey, more especially because from this time forward engineers were seldom to be spared from their normal duties on buildings and works.

About 1780 the Surveyor General had secured the services of young engineer. Wilford, for work on his Atlas of India, and in 1787 his successor, Wood, obtained the services of two others, Anburey and Stewart, as draughtsmen; in 1788 Wilford was deputed on a survey of Benares, and Colebrooke was posted to charge of the drawing office.

At the close of the Mysore War Colebrooke and Anburey returned to Calcutta, and on Colebrooke's appointment to be Surveyor General, James Hoare was brought into the vacancy as third assistant, whilst Wilford, on completion of his survey of Benares, was allowed to remain there on special duty, being borne on the list as first assistant. In 1796 Blunt, who had been employed on important field surveys, was brought in as fourth assistant to the Surveyor General. Blunt and Anburey shortly after found employment in the Commissary General's department, though they nominally remained assistants in the Surveyor Generals office. Hoare died and was succeeded first by Haywood, who had been a naval midshipman, and then on Haywood's death by Upjohn a local civilian. Ujohn's death in 1800 left the Surveyor General with no assistant actually at headquarters, and Government thereupon abolished the four posts and the salaries attached to them [275 n. 1][2].

During this period various officers were employed on special surveys, the most notable of whom was Thomas Wood of the Engineers, who had made surveys on the Brahmaputra and Irrawaddy rivers, and from 1798 was surveyor with the army in Oudh.

Being a practical surveyor himself, Colebrooke introduced various orders to enable the Surveyor General to exercise stricter control over officers employed on military or other surveys; these rules provided for the issue of professional instructions from the Surveyor General on each occasion, which should fix a definite time for the completion of the survey, and for the regular submission of reports and copies of work done [196–7].

MADRAS SURVEYORS

The earliest surveyors in Madras were officers, such as William Jennings, who made occasional surveys of the marches of the armies during the wars against the French before 1757; John Call probably carried out some surveys of this sort, and at any rate took a lead in encouraging geographical work of all sorts, and as Chief Engineer was responsible for the compilation of many plans of the southern parts of the peninsula. Engineer officers were detailed for all surveys called for by Government; Barnard, Cotsford, Stevens and others being so employed at various times before 1770.

The Corps of Engineers had a curious start in Madras; it was "formed into a regular Body" from 1759, though one officer's commission as Sub-Engineer and

[1] BPC. 1-12-83 (23). [2] BMC. 19-3-1801.

Lieutenant dated from December 1756, and Call's commission as Sub-Director and Captain dated from January 1st 1757. Several of the earlier officers held appointments in the civil list as well as their commissions as engineers [268].

In 1763 the Directors wrote out,

Mr. Call presses much for Young People to be sent out as assistants in the Engineering way, but We find it very difficult to engage such. We recommend it to you to enquire among Our Writers for such as have a turn to that Profession, & employ them accordingly. Mr. Charles Desvoeux, one of those who go out this season, We know draws, and may therefore be more easily initiated, and We are informed some others have that Qualification [1].

Desvoeux's talents were but little turned to survey but both Cotsford and Barnard held commissions as Engineers and appointments as Writers. Cotsford was selected for civil charge of Ganjam for the special purpose that, in addition to the administration of a new and turbulent district, he might attend to the construction of defence works, roads, and maps [92].

With his petition for appointment as writer, Barnard had submitted a certificate that

Thomas Barnard attends the Royal Military Academy very constant and regularly; is particularly assiduous in his studies, and had made very good proficiency in the several parts of Mathematical and other learning necessary to a military employment [2].

On his arrival he was placed under the Chief Engineer, given a commission in the corps, and employed on the survey of the *Jāgīr* [88].

In 1769 all engineer officers were called upon to decide between the civil service and the corps; Barnard and Cotsford chose the civil, and Montresor the infantry, and on Call's retirement in 1770 Stevens and Marsden stood alone on the engineer list. The Madras Council had given warning of the unpopularity of the corps some years before,

We cannot expect they will stay longer in the service than till something more advantageous offers. ... Mr. Call has had great difficulty to prevent their going into the Military, where they have a better chance of rising to higher rank [3] [266].

The Directors now had to fill up the Corps by appointments from home. Patrick Ross came out as Chief Engineer in place of Call, and Pittman, another of the new arrivals, proved a valuable surveyor. Ross took a keen interest in the organisation of such surveys as were ordered by Government, and the drawing and compiling of maps formed part of the duties of the Chief Engineer's office for another thirty years [244].

Colin Mackenzie who came out in 1783 was one of the last of the Madras Engineers to play an important part in the surveys of that Presidency.

Various officers of the Civil Service were employed on large scale property and road surveys in and around Madras, whilst Cotsford, Maxtone, and others, found that the best way to get maps of their districts was to make the surveys themselves.

The general geography of the country, and the need of the army for route surveys, brought forward keen regimental officers such as Kelly and Pringle, the latter being responsible for the formation of the Corps of Guides which produced a long train of enthusiastic surveyors, Beatson, Allan, Orr, and lastly Valentine Blacker.

We have already referred to those capable men, Topping, Goldingham, and Mather, who came out to Madras in search of employment and did yeoman service in the cause [268].

A subject that is always interesting is the relation between professional surveyors and the military commanders or civil administrators of the districts in which they are working. In 1775 Lieutenant James Johnston, on survey in Vizagapatam, had a dispute with the local military officer; the Chief Engineer reported that the O. C. Troops at Vizagapatam had called on Johnston for "sketches and Reports on the Passes", and he asked that local officers "should not be allowed to interfere with the work of the Surveyors, who received their order from the Chief Engineer". Government ordered that

[1] CD to M. 9-3-63 (55). [2] WP. Vol. V. [3] M to CD. 27-3-65 (33).

plans and Reports do not pass through the Military Commandants, nor that the Engineer Surveyors be looked upon as acting under their orders, but that Every Paper, Plan, and information concerning the Survey, be transmitted to the Chiefs and Councils...under whom the Surveyors are placed [1].

Amongst the regulations laid down for engineer officers at Fort St. George in 1787 were the following;

No Engineer...is permitted to make out or present any plan or design of any Public Work, or Survey or Sketch of any District of the Country, without a special order from Government for the Purpose. When employed in Surveying they are to inform the Chief, Resident, or Commanding Officer of the District of the manner in which they are employed and apply to them for...allowances and other assistance.

[Surveyors are] to inform the Chief Engineer of their progress once a month or oftener [2].

In 1791 the Chief Engineer reported that the only officers then drawing Surveyor's allowance were Norris, of the Engineers, who was working for the Board of Revenue in the *Jāgīr* [143]; Baron Reichel who was employed as draughtsman [245]; and "the Superintendent of the Company's Lands and Roads", this being a civil post which had been instituted in 1778 [94].

All Engineer officers did not make successful surveyors; in 1792 Lieutenant George Johnstone protested against the nomination of Ensign Caldwell for the survey of Barrah-maul, to which he conceives himself entitled, from having been formerly ordered on a similar duty in the Salem Country...

but, according to the Chief Engineer, his report and sketch of the Guzalhatty Pass [3] had been executed in a very imperfect manner for Lord Cornwallis, and was so perfectly incomprehensible as not to be understood either by His Lordship's secretary or by myself [4].

In later years Mackenzie attributed the incompleteness of the surveys of the Madras Presidency to the frequent changes of personnel;

Officers have been repeatedly appointed, even so late as 1786, but with little effect, ... [owing to] the change and removal of Surveyors, & the want of a fixed establishment & office or Depot. ... The employ of Engineers in one light promised fair at first, but the necessity of removing them for professional duties occasioned greater inconveniences [5].

BOMBAY SURVEYORS

The earliest surveys on record in Bombay were made by Engineer officers on the strength of the Artillery Company, De Funck and De Gloss and Turner, and as time goes on we find a larger proportion of Engineers were employed on surveys in Bombay then in any other Presidency. The most notable surveyors was Charles Reynolds who came out as an infantry cadet at the age of 14, and took to surveying as a hobby. He was given the post of Surveyor General to the Bombay force that proceeded to the Malabar Coast in 1782, and on his return was appointed Surveyor on the Bombay Establishment, and continued as such without interruption till he again went on service to Malabar in 1790, this time in the capacity of Assistant Deputy Quartermaster General, but once more being mostly employed on survey. In 1789 he had made particular request to be retained on survey fearing that,

being by rank near the Command of a Battalion of Sepoys, ...I am apprehensive of being shortly ordered to charge of one. This, although a flattering and honorable situation, I could wish not to be called to until I have completed my map [6].

Some time before 1789, Emmitt was appointed "Assistant to the Surveyor [128]", and they were both struck off the strength of their corps. At the end of 1795, Emmitt returned to Europe, and Moncrieff was appointed assistant in his place. Moncrieff being at this time employed with several other officers on the survey of Malabar, was given command of the newly authorized Corps of Pioneers, and much to Reynolds' disgust was not able to join him at Surat until 1801.

[1] Mack. MSS. LXVIII, 20-7-75. [2] Mack. MSS. LXIX, 23-6-87. [3] Gazalhatti, 58 E/2. [4] Mack. MSS. LXIX, 15-11-92. [5] Report on Northern Circārs. MRIO. M. 60, 29-11-1810. [6] BS & Pol. 19-6-89.

CHAPTER XX

PAY & ALLOWANCES

Surveyor Generals of Bengal — Bengal Surveyors — Madras Surveyors — Bombay Surveyors.

WHEN Rennell was appointed Surveyor General his salary as such was fixed at Rs. 300 a month [1], which made his monthly pay,

Pay as Surveyor General ...	...	...	Rs.	300	
Pay as Captain ...	...	...	„	120	
Batta [2] as Captain	...	...	„	180	Total 600

At the exchange of those days, 8 Rupees to the pound sterling, this was equivalent to £900 a year [3].

In addition to these personal allowances he was allowed establishment charges [289].

His salary was charged to the General head under civil charges, "his surveys being as much on a Civil as a Military account" [4].

In 1776 the salary of post was raised from Rs. 300 to Rs. 500, and in 1779, when Call was Surveyor General, the Commander-in-Chief, Sir Eyre Coote, suggested that this was insufficient;

The allowance...for the Surveyor General does not appear to me to bear any proportion to the allowances established for the other staff Appointments; the importance of the Trust, and the abilities requisite for filling the Office duly considered, ... with the danger to which all Surveyors are inevitable exposed from the severity of the Climate alone. I must therefore beg leave to recommend an increase in the Salary of the Surveyor General, and I have to propose it as this officer is precluded from deriving any advantage from his profession as an Engineer, either by Field Service or otherwise.

The Governor General, Warren Hastings, supported this proposal;

I most heartily concur in the opinion expressed by the Commander in Chief, ...and on this ground I recommend, ...Salary Rs. 651; House Rent Rs. 400. ...

Could I hope that my recommendations would prevail, I would further purpose that the Merits of the last Surveyor General...should be again reported to the Court of Directors, that if they shall approve of the salary now recommended, it may be further ordered to take place from the first day of his appointment [5].

The Directors passed a salary of £1500 a year without retrospective effect, but under the retrenchments of 1785, this was brought back to £750 a year, or Rs. 500 a month [6], in addition to pay and batta of regimental rank, and house-rent of rank when not allotted free quarters.

This salary contained no provision for establishment charges, and when Colebrooke, as Surveyor General, went out to survey the Churni River in 1795 [63–4], he had great difficulty in obtaining special sanction to draw the further allowances of a Surveyor of Rivers, Rs. 240 a month, to cover the hire of his boats [7] [276].

In 1800 he pressed for an increase of salary;

The office of Surveyor General, having formerly been in the Civil Department, although usually held by a military officer, was, on it's being transferred to the Military Department in the year 1785, considerably reduced both in salary and establishment. That this office

[1] BPC. 8–1–67. [2] Allowance during absence from headquarters. [3] This remained the official rate of exchange for *sonaut* rupees for many years (cf. MMC. 14–3–88); a *sonaut* rupee was one that had been in circulation two or three years, and stood at a discount against a *sicca*, or new rupee; 100 *Sa.* to about 105 *St.* [4] HMS. 344 (56). [5] BMC. 16–7–79 & 9–8–79. [6] HMS. 79 (436) & 356 (77). [7] DDn. 16 (41), 17–6–97.

has since that period, increased in importance, has been evinced by the successive appointment of four assistants [271]; yet the duties of it, which are in a considerable measure connected with the civil department, must from their nature continue to be exercised chiefly by the person at the head of the office. That the salary allowed to the Surveyor General continue nevertheless the same as on its first reduction, viz. 500 Sonat Rupees per month, a sum not exceeding what is now drawn by the first Assistant to the Secretary of the Military Board, and falling considerably short of the salary annexed to the head of any office, or department, under Government.

That the First Assistant attached to the Surveyor General's office, Captain Wilford, now stationed at Benares, is in the receipt of a monthly allowance of 574 Sicca Rupees or 600 Sonats, which, added to Rs. 250 in his capacity of assistant in this office, makes up his allowance to Rs. 350 more than the salary above mentioned [1]. ...

I...hope your Lordship may be pleased further to consider the late acquisition of territory in the Peninsula, the several surveys of which it will be my pleasing task to reduce and insert in a new general map of India [220]; the recent appointment of a marine surveyor to act under my instructions, and the new military survey at present carried on in Oude and Rohilkund [57–8], as conferring some additional importance, increasing the labour and responsibility of my office, and strengthening my claim to an increase [2].

Government refused this request, adding

Whenever you may have the execution of any Work of an Extraordinary nature or extent, His Lordship in Council, upon the circumstance being submitted to him, will readily take into consideration the propriety of rewarding you for such work [3].

BENGAL SURVEYORS

It is well known that till late in the 18th century the East India Company did not pay their civil servants more than a few pounds a year [4], but granted them the right of private trading, on the proceeds of which they were able to retire after a few years with comfortable, or even handsome, fortunes.

Military officers were on a different footing. Their privileges in trading were closely restricted until withdrawn altogether [5]; they drew reasonable salaries and *batta*, and infantry officers had claims on prize money.

In 1762 the pay of the Engineering Branch was settled at the same daily rates as officers of Infantry, viz. [6],

Captain	...	10	shillings	(Rs.	4	) & Batta	Rs.	6
Capt. Lieut.	...	5	,,	(,,	2	) ,,	,,	6
Lieutenant	...	5	,,	(,,	2	) ,,	,,	4
Ensign	...	4	,,	(,,	1–10	) ,,	,,	3

whilst in 1768 the Directors approved

an additional pay by way of Gratuity or Donation in the same way as the rest of our Military Officers, that is to say, those in the Rank of Captains 3 shillings a day, Lieutenants 2 shillings, and Ensigns one shilling [7].

It is not known what allowances were first drawn by surveyors in Bengal, though on Rennell's appointment in 1764 he was given the same allowances as had been drawn by Cameron [8]. The first rate drawn by Madras Surveyors was 10 shillings a day, and the equivalent, 4 rupees a day was the established rate in Bombay. It is probable that this was also the rate first allowed in Bengal, viz. Rs. 120 a month.

Our first certain information on the subject is in June 1768, when

the Military Paymaster General lays before the Board the Disbursements of the Different Surveyors, which he deems very extravagent; he begs leave to submit to their consideration, so that they would be pleased to establish some regulations in order to reduce the great expence incurred in this Branch of Business [9].

The subject was referred to a small committee which recommended that the surveyors should draw pay and batta according to their rank in the army and

[1] This particular grievance was remedied a year later by the abolition of all the assistants [271]. [2] DDn. 16 (152), 27–1–1800 & BMC. 11–2–1800 (67). [3] MRIO. M. 11–2–1800. [4] Factors, £ 15 a year, Junior Merchants, £ 30, Council, £ 40 (BPC. 13–10–66). [5] See comments by Rennell [Bio. notes]. [6] BPC. 22–11–62. [7] Following the settlement of the "Batta" Mutiny of 1766. [8] BPC. 9–4–64. In his own account Rennell includes establishment charges, *v.* Bio. Notes. [9] BPC. 30–6–68.

also allowances as surveyors—if a captain, Rs. 150 monthly—if a subaltern, Rs. 100—whilst the Surveyor General should continue to draw Rs. 300. They reported that they had found "the Accounts & Disbursements of the several Surveyors, ...uniform in nothing but in the arrangement of the different Heads, each varying in these charges, and in some extravagant". They recommended that when actually employed on river surveys, a captain should be allowed Rs. 240 for boats, and a subaltern Rs. 195[1]. Stationery should be indented for from the nearest factory or brigade. They also laid down scales of establishment charges, with definite regulations[2].

Rennell protested at once, more especially against the "the small number of assistants allotted", and his own recommendations, as under, were duly authorised;

The Surveyor General was allowed an establishment of,

A draughtsman	... Rs. 120	2nd Assistant	Rs. 60		
1st Assistant	... 90	Followers	318	Total Rs.	588

making, with pay and allowances, a total sum of Rs. 1,188 which he apparently drew all the year round without having to submit acquittance rolls. The full allowances for the surveyors now became[3],

Captain,	Pay as Surveyor	Rs.	150				
	do. Captain		120				
	Batta as do.		180	Rs.	450		
	2 Assistants @ 50		...		100		
	Followers ...		...		310	Rs.	860
Lieutenant,	Pay as Surveyor	Rs.	100				
	do. Lieut.		60				
	Batta as do.		120	Rs.	280		
	Estabiishment		...		410	Rs.	690
Ensign,	Pay as Surveyor	Rs.	100				
	do. Ensign		50				
	Batta as do.		90	Rs.	240		
	Establishment		...		410	Rs.	650

These rates were thus notified to the Directors;

The Surveyor General...represented to us that it was utterly impossible to pursue the business with the small number of Assistants, Lascars, Coolies & Hircarrahs allotted to that establishment, & at the same time delivered in an Estimate of the necessary expences attending them.

As this Estimate of Captain Rennell's is founded upon experience, and he assures us calculated with the utmost Oeconomy, and we were of opinion that the small addition proposed by the Surveyor General was not an object to be put in competition with the material consequence it is to you to have this Branch of Business properly conducted, we consented to augment the Surveyors' charges agreably to Capt. Rennell's proposals; but we by no means approve of any Innovations upon our Regulations, nor would we have receded from them but from the opinion we entertain of Capt. Rennell's Integrity, Judgement, and Frugality, and that an addition to the allowances was absolutely necessary[4].

Just before he left India Rennell put forward a revised scale, exclusive of military allowances, that was accepted, and published in General Orders;

Surveyor	Rs.	100	
2 Assistant Europeans @ 50		100	
Followers [289]		426	
Stationery		12	Rs. 638

When a Subaltern Officer attends as an assistant, pay...Rs. 70, and 6 Coolies, Rs. 30, should be added.

In surveys of a difficult nature; by which I mean those that require strong Escorts & long Marches (such as in the Southern Part of Ellahabad, & part of Palamau) an extra allowance may still be required; but this being a mere contingency, it is impossible to determine the sum before-hand[5].

In 1785 the Directors sent out orders for drastic retrenchments all round [5, 38], and the Council called upon

[1] Became the established allowances for River Surveyors, [277]. [2] B to CD. 13-9-68 (119).
[3] BPC. 11-10-68. [4] B to CD 2-2-69 (77, 78); accepted under CD to B, 23-3-70 (156). [5] BPC. 28-4-77.

the Chief Engineer and Surveyor General to furnish us with a report of all officers employed in survey, or receiving allowances of Surveyors. ...

Having received the report, ... we have recalled all Surveyors from the last day of the present month; we have ordered that their allowances do cease from that period, and that no persons be employed on this duty in future but by special order of the Board.

We have also resolved that no allowances be granted from the end of the present month to Engineer officers excepting their pay and Batta, unless by order of the Board for particular services.

It appears from a statement...by the Commissary General, that the allowances, fixed or contingent, paid to officers employed on survey, ...amount by the latest bill to no less a sum than Rs. 17,405-8-0[1].

With a view to maintain close control of expenditure the Surveyor General was eventually directed to report at a stated period, such surveyors as are employed under his immediate superintendence in the surveys of country's and Sea-coasts[2].

The revised allowances were published in October 1785;

Surveyors, as such, are to receive for every charge, as well within as without the Provinces, Sonat Rupees 618 per mensem[3], with an addition of Sonat Rs. 240 per mensem, if employed on rivers; but they are only to receive 250 per mensem during the rainy season, viz. from 1st June to the 15th September.

The Assistant Surveyors, as such, to receive for every charge, ... 100 Rs. per mensem, with an increase of Rs. 195 per mensem, if employed on rivers.

(Surveyors and Assistant Surveyors, being Military Officers, also receive the pay, full batta, gratuity and tent allowance of their Regimental Rank.)

These allowances covered all contingent charges, stationery, instruments, and establishment[4], and were still in force more then eighty years later.

Although these reductions did not bear so heavily on the Surveyors as upon their Surveyor General [274–5]; it is worth while quoting here the apologies of the Directors for the retrenchments made;

We are aware that in consequence of the directions we have given, many of our servants will undergo a very mortifying alteration in their circumstances, but the situation of our affairs renders it absolutely necessary. ...

We expect a ready and implicit acquiescence in all our servants, Civil and Military, to the reductions which you shall direct...and should any of them so far betray a spirit of dissatisfaction, as to impede, or embarass, your preceedings upon this subject, we direct that they be instantly dismissed the service, and sent to Europe.

To relieve us from our present exigincies, no alternative we think can be devised[5].

The Surveyor General was able to rescue from retrenchment the allowance of Rs. 250 a month for Wilford who had been working in the drawing office for several years [235], and in 1787 the allowances of Anburey and Stewart were fixed at Rs. 150 a month;

When it is considered that the Monthly Writers in Public Offices are paid Rs, 150, and that the duties of a Draftsman, not only require as close application, but a particular sort of Education, ... this will be considered a moderate encouragement for Gentlemen to give up the whole of their time and application[6] [236].

In 1789 Colebrooke, was posted as assistant on a salary of Rs. 250 a month [237][7]. On his return from the campaign in Mysore, where he had been employed for nearly two years on survey, he applied for further compensation,

I have been at a considerable expence in execution of this survey, and as my salary of assistant to the Surveyor General has proved inadequate to the additional expenses incurred, and I humbly presume was not meant to defray the charges of an actual survey, I have ventured to hope that the allowance established by Government for a Surveyor in the field, or the difference between that allowance and my salary, might be allowed me for the time I was employed upon this service[8].

He was allowed a gratuity of six thousand rupees.

On his promotion to be Surveyor General, he asked for an increase to the allowances drawn by his assistants, but was given reply,

[1] B to CD. 31–7–85 (71–2). [2] BPC. 29–5–89. [3] A reduction of Rs. 20 made in establishment of followers fixed in 1777 [276]. [4] BMC. 11–10–85, & see Greene (41, 265–267) & Carroll's Code. [5] CD. to B. 11–4–85 (34, 39, 40). [6] BMC. 9–3–87. [7] BPC. 10–7–89. [8] B Pol C. 19–2–93 (19).

Government do not think it proper to make any alterations in the allowances fixed for your office by their resolutions of September 11th 1786 and June 12th 1788. The following allowances are to be drawn by these assistants [1].

		Rs.	
Lieut. Wilford	1st Assistant	250	per month
Ensign Anburey	2nd ,,	200	,,
Lieut. Hoare	3rd ,,	100	,,

The salary of surveyors who were not military officers had to be especially decided. When detailed for his special astronomical survey Burrow was granted 500 *sicca* rupees a month in addition to his salary of 500 as teacher of mathematics, and Government paid for all his instruments and transport[2].

When Blair was sent on the survey of the Andaman Islands he was told,

Your allowances while employed on the survey are fixed as Sont. rupees 858 per mensem, and further sum of Sont. rupees 30 per mensem will be paid to your order, that you may divide it among the Gentlemen proceeding with you, in such proportions as their services may appear to you to deserve[3].

To recompense Dr. Hunter for his surveys Government made him a gratuity approximately equal to the amount of a surveyor's allowances at Rs. 618 per month for the period he spent on the work[4].

When Haywood was appointed junior assistant in Surveyor General's office in 1798, he was allowed Rs. 300 a month, on the following calculation;

Bt. Captain Hoare drew a salary of Sonat Rs. 150 per month, in addition to which he had Rs. 60 for house rent, and full batta, which amounted to about 300 St. Rs. over and above the pay and half batta of his rank, but Mr. Haywood, not being on the Army establishment, ... to obviate any idea of his having a larger salary than the senior assistants in the office, the oldest of whom, as such, is only allowed 250 rupees per month, [is recommended] salary 150, Subsistence 90, House Rent 60, Total 300[5].

Surveyors often had difficulty in cashing their salary bills, as the following letter from Wilford will show;

Some time ago I sent my Bills to the Pay Master at Chunar, but he has refused to Discharge my allowance as Surveyor, and even my Pay and Batta Bills.

There are now five months I have received no Pay or Allowance, and I cannot even form an idea when, or even whether, I am to receive any, notwithstanding which, the service I am upon has not suffered the least interruption. ... In this distressed Situation and State of uncertainty I...beg you will address my case to the Hon'ble Board; ...I shall not much longer be able to fulfil the labourious duties of my present station, and advance the money to defray the great and unavoidable Expenses attending it.

The Military Auditor General then authorized the Pay master at Chunār to withdraw the prohibition[6].

The rules of 1796, under which the Military Auditor General was not authorized to pass the bills of a surveyor until he had been notified by the Surveyor General that all journals and field books had been received and found satisfactory, gave rise to frequent delays and complaints [197]. So also did the rule that Surveyors should not draw more than Rs. 250 a month from June to September [277]; in Upper India it often happened that a surveyor was obliged to carry on work in the field through these months but, whatever the circumstances, the paymasters and the Auditor General stuck closely to the regulations, and surveyors who wanted them relaxed generally found Government very firm.

MADRAS SURVEYORS

Regulations on such subjects as allowances varied from one Presidency to another. In Madras the standard coin was the gold Pagoda[7].

The first order that has been found regarding the pay of surveyors in Madras is one of 1769 when, on Barnard's surrender of his commission as Engineer, it

[1] MRIO. M. 574 16-6-94. [2] B to CD. 9-2-84 (26), & 25-6-87, (331). [3] BS. & Pol. 22-12-88. [4] DDn. 16 (47-8) 12-4-94. [5] DDn. 16 (102), 26-11-98. [6] BMC. 25-5-92 (716). [7] 80 *Kas* or *cash* = 1 *Fanam*; 42 *Fanam* = 1 *Pagoda* = from 3 to 4 *sonaut* rupees, or 8 shillings, according to exchange [280].

was ordered that during the survey of the "*Jāgīr*" he should draw "ten shillings per day as pay, and six Rupees[1] as Batta, the usual allowances made to Civil servants employed out of garrison"; his pay as Engineer was to cease[2].

On the deputation of engineer officers to survey the Northern Circârs in 1773, it was ordered that Pittman should draw "the same allowances which were made to Mr. Barnard when he commenced the survey of the Jaghire". Johnston, being yet a cadet, was allowed Ensign's pay and batta until the survey should be finished[3].

In 1775 the Chief Engineer recommended that "fixed allowances be established, ...exclusive of what they may be otherwise entitled to", submitting a copy of the Bengal rates as a model, and in 1776 the following resolution was passed by the Council,

The Board, taking into consideration the Allowances drawn for by the several Surveyors employed in the Company's Lands, do now resolve to fix them on the following Establishment.

Surveyor's Allowances to take place from the 1st December 1776.

Pay and Batta, which as an Encouragement to those who are appointed Surveyors, are fixed at 10 shillings & 6 rupees a day;

per month of 31 days, ...	...	...	Pagodas	88	14 56
,, 30 ,, ...	...	...	,,	[85	0 21]
Horse Allowance, ...	...	per month	,,	6	0 0
Allowance in lieu of Tent Money	...	,,	,,	5	0 0
Bullock hire, including Packally	...	,,	,,	7	0 0
Interpreter's Allowance (to Northward)	...	,,	,;	10	0 0
,, ,, (to Southward)	...	,,	,,	8	0 0
	Total (31 days)		,,	124	14 56[4]

[Followers to be provided from Government establishments.] ...

If any Surveyor be obliged to leave the service on which he is employed from ill health, or upon Account of private affairs, or during the Monsoon, the Batta and all Extraordinary Allowances are to cease until he shall have returned to that service again. ...

Each Assistant Surveyor to receive as a proper encouragement for a month of 31 days, 88 Ps. 38 40 c[5].

It is recorded that under the Printed Regulations of the Presidency...Subaltern Officers employed as Surveyors are permitted to draw the full Batta of Captains, and the sum of 10 shillings per Diem as staff Pay. They further receive the monthly sum of six Pagodas for Horse Allowance, and they are provided with lascars for the carriage of their instruments at the Public charge[6].

These allowances did not apply to military officers surveying the routes of an army and, in pointing out Pringle's good work as surveyor, the Commander-in-Chief writes in 1777 [95],

The expence may be judged of from Mr. Pringle's being necessitated to keep coolies to carry his extra Baggage and Pallankeen, with two horses, and his men to work the Perambulator; besides the expence of instruments, and of a theodolite lately purchased; the General had occasion to see these articles of necessary expence whilst Lieutenant Pringle accompanied him[7].

and the Council resolved,

in consideration of the merit and services of Lieut. Pringle, that he be appointed Captain of Guides to the army, as recommended by General Stuart; and that his allowance as such be 10 shillings a day, exclusive of his pay as Lieutenant, and Captain's Batta when employed on service.

Pringle found that these allowances did not cover his expenses, and in 1780 appealed to Government;

I have hitherto, Sir, executed that necessary Branch of my Employment as Captain of Guides, *Surveying*, without any allowance having been made me on that score, which has

[1] 100 *sicca* rupees-about 107 *arcot* rupees. [2] MMC. 26-1-69. [3] MMC. 19-7-73. [4] The consultations give totals as here shewn, though both rates of Interpreter's allowance could hardly be drawn by one surveyor. [5] MPC. 1-11-76 & MMC. 24-3-77. [6] MMC. 11-11-1806; minute by Governor. [7] MMC. 5-8-77.

been greatly distressing to me, and has repeatedly sent me back to the Presidency much impoverished in my finances; but particularly the Extraordinary Expence I was obliged to be at in journeying to Mahé alone, before the march of the Army, fell heavy upon my circumstances [96].

As I have had sufficient experience of the bountiful Dispositions of my Hon'ble Masters to know that it is not their intention that any Person in their service, who in the Course of their Duty is obliged to make Extraordinary Exertions of this kind, should suffer thereby, I am induced to apply...[for] the allowances of a Surveyor whilst employed in the field, as settled on Consultation Nov. 1st 1776 (except the Batta, which I cannot expect...as I drew Batta in another capacity), in addition to my former Pay and Allowances as Captain of Guides.

On this the Council passed the following resolution;

To enable the Captain of Guides the better to execute his Duty, that he be allowed a Brevet as youngest Captain in the Army, *whilst acting in the Field only*; ...and to enable him to execute that laborious Branch of his Duty, *surveying*, that he be permitted to draw the allowances of a Surveyor, whilst employed in the field; ...It having been customary so to allow to any of our officers who have been employed on that kind of service[1].

In 1780 Kelly was put on special survey duty for a short time [97], but the very small allowance granted to assist me in carrying on the work, was so very inadequate to my expences, that I was exceedingly happy when it was discontinued a few months after it had been granted[2].

He writes again,

In January or February 1780, a letter from their Secretary informed me that...I had their permission to continue the survey, and to enable me to carry it on, they had been pleased to grant me the pay Batta of Major till the Company's pleasure should be known. (It should here be observed that I only drew Captain's pay then, in common with the other brevet Majors). My enjoyment of even this emolument, inadequate as it was to my expences, was but of short duration. For in October 1780 another letter from the Secretary informed me that as my services would be required with my corps in the field, the Board had thought proper to discontinue my allowance as Geographer[3].

On the appointment of Topping to survey the Coromandel Coast, he was granted captain's pay and batta from the time he started his first survey from Muslipatam in November 1786; and in addition drew the allowances of a Captain of Guides from the start of his survey to the South[4]. After a while he applied for better terms;

Mr. Reuben Burrow in Bengal, a Gentleman out of the regular line of the service, as I am, is employed...on a business similar to mine, for which he is allowed 1500 Rupees per month, or three times as much as I am allowed[5]. My operations are of a much more arduous nature than Mr. Burrow's are; his being Astronomical observations only, while I have undertaken a laborious *Geometrical Mensuration* besides Astronomical observations. ...

I agree to defray all extraordinary expences of my present undertaking such as the Wages and Victualling of the people on board my vessel, the Batta of the lascars, hircarrahs, and other people with me, with all contingencies; provided Government will allow me to draw 500 Pagodas per month, a sum not greater than Mr. Burrow receives for himself alone. ...

I do not desire an additional salary for this additional service, ... nor for directing everything necessary to be done at the Observatory[6].

Whilst the Madras Government ruled that "the extra charges he may be at, in carrying on the survey, will be regularly paid, on the account being presented monthly", the Directors refused to raise his actual salary, which comprised the following amounts, drawn as a fixed sum throughout the year;

				Pagodas a month
Subsistence, Batta, & Gratuity as Captain of Guides		approx.	...	96
Pay as Surveyor	...	...	...	36
Horse, Tent, & Packally	...	...	...	20
Interpreter	...	...	...	10
Palanquin & Writer	...	...	...	30

a total of about 192 Pagodas a month, or about £932 a year[7]. This sum was continued to Beatson when he took over Topping's surveys in 1798, but in addition to his military pay.

[1] MMC. 18-3-80. [2] Kelly's Atlas (Address). [3] M. Sel. C. 23-10-79 & BPC. 27-5-82. [4] MPC. 11-9-87. [5] Burrow only drew Rs. 1,000/- a month [278]. [6] MPC. 30-1-89. [7] Pers. Rec. 15 (199).

Mackenzie raised the question of his allowances whilst Engineer and Surveyor to the Nizām's Detachment;

The Surveyor's allowance I have hitherto received...amounts to no more than 37½ Pagodas a month[1] (Captain's additional Subsistence) and...I have incurred considerable contingent expences[2]...

but the only reply he received was that,

Though the Governor in Council is fully sensible that the allowances drawn by you are not adequate to the labour and importance of the office for which you have been recommended to the Hon'ble Court [Surveyor General, p. 264] he does not feel himself at liberty to anticipate their decision[3].

He had obtained the sympathy of Colebrooke who wrote from Calcutta,

The work you are engaged in must, no doubt, be laborious and expensive, and your allowances are certainly small, which circumstances I will mention to Sir John Shore [81 n. 14] on his return from the Upper Provinces: but I cannot possibly say what compensation our Government will be induced to make you, as it is possible they may not like to interfere with the Madras Government[4].

and again,

With regard to your allowances, I am sorry to observe they are so small. It was my intention to have spoken to Sir John Shore on the subject had he stayed any time between his return from Lucknow and his departure for Europe, but he went away in such a hurry that it was impossible to do so. I cannot venture to represent this matter publickly to our Government, and I have to lament that the little acquaintance I have with the present Governor General[5] would render a personal application improper, and in all probability unsuccessful[6].

At Colebrooke's advice Mackenzie raised the question very strongly from Hyderābād, where he now, 1798, found himself attached to Bengal instead of Madras troops, and pointed out that

he has only received the former Surveyor's allowances, and not those of 618 Rupees per month, which the youngest officer from that Presidency would be entitled to receive for that duty exclusively[7].

The Council thereupon increased his allowances to 200 pagodas a month[8] as Principal Engineer to the Nizām's Detachment, and eventually the Directors authorized the Council

to present him with the sum of Pagodas 2400...for his past services in this line, and approve of your having allowed him a salary of Pagodas 200 a month, in addition to his pay and allowances as Engineer with the Hyderabad Detachment[9].

BOMBAY SURVEYORS

The normal rate of special pay for surveyors in Bombay appears to have been 4 Rupees[10] a day, which Reynolds drew from the time he was attached to the Resident at Poona [127].

At the close of the Mysore War of 1790–92, the following regulations were laid down on the recommendation of the Commander-in-Chief, Bombay, deduced from the experience gained from the work of the Bombay surveyors during that campaign.

1st. No survey to be undertaken but by order of Government.
2nd. Engineers or Officers surveying with a detachment to be allowed 4 rupees a day.
3rd. Officers detached on surveys to be allowed 500 rupees in lieu of everything.
4th. Copies of surveys to be paid for agreeably to the scale; If an inch to two miles, and three copies are required, they are to be completed at the rate of 750 miles a month, for which 500 rupees will be in future allowed[11].

The pay of a Lieutenant, as drawn by Emmit in addition to the Survey allowance, was

Pay as Lieutenant	...	Rs. 62	
Gratuity	...	24	
Language Money	...	30	Rs. 116

[1] 10 shillings a day. [2] MMC. 6-2-98. [3] MMC. 3-3-98. [4] DDn. 14 (52), 7-12-97. [5] Lord Mornington, later Marquess Wellesley. [6] ib (66), 23-3-98. [7] MMC. 6-11-98. [8] About £970 a year, in addition to pay & allowances of rank. [9] CD. to M. 7-5-00 (175). [10] or ten shillings, as recognised also in Madras [279]. [11] Bo. MC. 3-7-92.

The pay drawn by Reynolds as Surveyor, at Surat in 1795, was

Pay	...	Rs. 702	
Established Allowances	...	876	Rs. 1576

These allowances covering Lights, Stationery, Carriage of Office Tent, and Attendants[1].

The allowance included Rs. 800 which had been allotted by the Governor General in 1793 to meet the expences of the survey towards Delhi and Rohilkhand [132]. On his recall to Bombay Reynolds was unable to draw this sum until the matter had been referred home to the Directors;

Captain Reynolds, who has been employed for a long time in Geographical Pursuits for the Company in different parts of India, represented to us that he had incurred a very considerable expence therein, exceeding his fixed allowances. We have no reason to doubt the truth of this assertion, and...submit his application to your decision[2].

to which the Directors replied

we observe that you have already made an addition of 800 Sonaut rupees a month to his allowances, sufficient in his opinion to enable him to complete the work in which he is engaged; so soon therefore as we shall be advised of Captain Reynolds having finished the business, ... we shall proceed to determine on presenting Captain Reynolds with such pecuniary gratification as his zeal, activity, and ability shall appear to merit[3].

On the receipt of this authority, Reynolds, who had become Surveyor General, was permitted by the Bombay Government to draw the arrears of this allowance, but the Bengal Government protested that it had only been granted for expences incurred on the Bengal side, and ordered that the arrears just drawn should be at once refunded. This drew a sturdy protest from Reynolds, who explained that the purpose for which Sir John Shore had authorised this allowance was the general geography of India which was still being pursued from his headquarters at Surat, and that the chief expence for which this special allowance was required was the pay of his native surveyors [287–8];

I am at this instant nearly seventy thousand rupees out of pocket by my pursuits, and am still willing to trust for remuneration to the merit of the work when completed[4].

The Bombay Government supported him nobly, so the Supreme Government gave in graciously, and allowed him to retain the allowance from 1793 onwards[5].

At the end of 1799, on the order of the Directors, the payment of these surveyors was taken over by the Bombay Government [288].

Over and above this special allowance for establishment, and the substantial gratuity which the Directors eventually paid him on completion of his map, Reynolds drew "Staff pay as Surveyor General, Rs. 702[6]".

[1]Bo. ME. 1795. [2]B to CD. 14–2–94 (83). [3]CD to B. 8–7–95 (95). [4]BoMC. 10–6–96. [5]BoMC. 6–8–96. [6]Report from MAG. BoMC. 30–4–1804; DDn. 146 (62).

CHAPTER XXI

CIVIL ESTABLISHMENT

European Assistants — Surveying School, Madras — Assistant Revenue Surveyors, Madras — Indian Explorers — Reynolds & his Surveyors — Lascars & Followers.

When Rennell set out on survey in May 1764, he was accompanied by an assistant surveyor and three other Europeans [17], the assistant surveyor being probably the Armenian who was killed in the fight against *sanyāsi* fakirs in February 1766 [23]. Of the others Rennell tells nothing except that one, "having cut a Dandy's[1] Ear off, I delivered him prisoner to the Chief" at Dacca[2].

When De Gloss set out on his survey of Bihār, he took with him from Calcutta four assistants, John Edwards, John Barnard Chausour, John Gerofflée, and Francis Sydra[3], but says nothing further about them [25].

Plaisted was allowed Rs. 250 a month for each of his assistants, Collins and Stewart, who were with him on his survey of Channel Creek and the coast line to Balasore [15][4].

In his orders to Barnard for the survey of the Madras *Jāgīr*, the Chief Engineer wrote,

To assist you in this Survey I send with you John Ashmole, who, besides his Pay as a Soldier, will have an additional allowance of 5 Pagodas p.m.[5].

In 1768 the Bengal Council sanctioned two "European Assistants" for each surveyor [276], "one for measuring, one for pointing out the Roads and placing flags". On river surveys, a special boat, or *willock*[6] was provided for them. It is very unlikely that such assistants were employed after Rennell's departure, but provision for them remained incorporated in the allowances.

Surveying School, Madras

Topping's proposal for establishing a school for surveyors [108], is given in the following letter;

Ten or twelve *Practitioner Surveyors* will be wanted. ... They might be raised in the following manner.

From the Male Asylum[7] and other English schools at this Presidency, a number of youths might be *selected*. These might be regularly trained to the business of practical surveying: first in the office, for the sake of a few rudiments; and afterwards in real field practice, under such Gentlemen as are employed in actual surveys, who (being doubtless well qualified themselves for their severe trust, and ardent to promote the General good) would cheerfully undertake to prepare them for future service, by receiving them as their daily Assistants.

Either this expedient must be adopted, or the same number of practical Surveyors must be sent to this country from Europe. ... My reasons for *preferring Native*[8] Assistants to *European* are the following.

First, every European...would cost the Company as much, at least, as six Natives; besides tents, conveyances, and a liberal allowance, each European practitioner must have an *Interpreter* to attend him. ...

[1] Boatman, *Hobson Jobson* (296). [2] La Touche (36). [3] Orme MSS. 9. [4] BPC. 12-1-67. [5] MPC. 5-3-67. [6] Smaller than a *budgarow*. *Hobson Jobson* (971). [7] This military orphanage eventually merged into "The Lawrence Memorial Royal Military School" now situated at Lovedale in the Nilgiri Hills. [8] For the next 50 years or more the term *Native*, used in its primary sense, was applied to persons of any race, born in the country.

Secondly, each European would require a long and previous seasoning, before he could sustain the rigors of an Indian sun and climate; it is indeed hardly to be expected that one European in ten, after leaving Europe at a *Mature* age, could be brought to endure, for a constancy, the fatigues of so laborious an employ in the torrid zone.

Thirdly, the ease with which the establishment might be kept up, from the same fountain, is a material consideration. ...

The Indian-born offspring of Europeans, educated in the public schools at Madras, might be rendered very useful to the public, and happy in themselves if, instead of being suffered to fall a sacrifice to idleness, and a vicious course, ... some line of active employment were to be marked out for them[1].

The Revenue Board strongly supported Topping's proposal;

The natives hitherto employed in making surveys of the Tanks etc., have been unqualified for a service of such importance and, without correct information or estimates, it could be no easy matter to detect, or prevent, abuses in the expenditure of the public money.

Whether the native practitioners be hereafter employed under the proposed office of Surveyor General, or any other Department in that line, it is obvious that the practical experience to be acquired under Mr. Topping, particularly during his present surveys, will enable them to be of essential advantage in accomplishing the grand design of providing works for the supply of water, upon which the improvement and prosperity of the country must materially depend[2].

Government thereupon

Resolved that the Board of Revenue be permitted to conclude an arrangement with the Governors of the Male Asylum, and the Directors of the Charity School, for the boys required in the Surveying Dapartment, agreably to Mr. Topping's proposition[3].

The Board of Revenue recommended that the boys should be formally indentured, that a building should be erected for their accomodation, and that Goldingham should be appointed to superintend their education at the Observatory, and Government directed that,

For the sake of order and decorum, the young men to be employed in so responsible a service should have a place of residence as near the eye of their superior as possible[4].

In June 1794 Government ordered that 12 boys should be indentured to the Company for seven years, and after instruction under Goldingham, should be employed under Topping[5]. The school was started in the Fort, probably on Oct. 1st 1794, and in June 1795 when the new building[6] was ready the Revenue Board wrote to Goldingham,

You have permission to remove the twelve articled boys from the school in the Fort to the Company's Surveying School.

The Right Hon'ble the Governor in Council has consented to your drawing the sum of 100 Pagodas for each of the boys, ...but this charge is considered a very ample allowance, and...may be understood to include every contingent charge of whatever description. ...

You are permitted to provide the several articles of furniture. ... Regular reports should be made by you of the progress which the Boys...make in their education...every six months[7].

Mr. J. V. Pereira, who had worked as a draughtsman for Topping since 1792, was engaged to instruct the boys " in the drawing branch ", and prepare maps for the Revenue Board[8]. Goldingham submitted his first annual report on the 1st October 1795, and it may be of interest to record the boys' names, for several of them did valuable work during the next 25 years. They were articled as Assistant Surveyors, but were more often known, from the nature of their normal employment, as Assistant Revenue Surveyors[9].

Charles Webb, aged on 1-10-95,	13 years	John Ambrose Johnson	16 years
Robert Gardner	14 „ & 9 months	Thomas Turnbull ...	12 „ & 6 months
James Allen	11 „ & 6 „	Thomas David ...	12 „
Samuel Godfrey	11 „	Henry Lincoln ...	16 „
William Webb	10 „ & 8 months	Silvester Pope ...	14 „
James Ross	11 „ & 6 „	John Robinson ...	11 „ & 8 „

In 1796 Goldingham reported that

three of the young men...are now ready for the public service; the professional knowledge they have would enable them to act alone were they not much too young, I therefore beg

[1] MRC. 10-1-94. [2] MRC. 31-1-94. [3] MRC. 4-4-94. [4] Mack. MSS. LXIX, 24-5-94. [5] MRC. 20-6-94. [6] Costing Ps. 1979 fs. 35 c. 64. [7] M. Rev. Bd. 5-6-95. [8] M. Rev. Bd. 10-12-1810. [9] Rev. Bd. 16-10-95.

permission to suggest the propriety of their being placed for the present under persons of experience employed on service, and furnished with such instruments, books, and cloathing, as may be deemed requisite for their outset [1].

Charles Webb, Gardner, and Johnson were accordingly sent to Dindigul in December, and furnished with a tent and lascars from the garrison there.

During the following year Goldingham submitted to the Board of Revenue a number of maps drawn by his pupils and their drawing master; he engaged a language master,

As a knowledge of the Country Languages is indispensable for the Assistant Surveyors, and as many of them, from not having been suffered to speak these languages at the schools they came from, are almost wholly ignorant of them, I have employed a Tutor for the Guntoor and Malabar languages at a salary of 8 Pagodas per month [2].

To fill up vacancies as the boys passed out to the districts, and to bring the whole establishment to 24 [3], others were admitted in 1798 and 1800.

ASSISTANT REVENUE SURVEYORS, MADRAS

After equipping and sending out three boys in 1796, Goldingham made the following proposals for their proper supervision [145];

Each set of Surveyors (two or three in number) should be placed...immediately under the Collector of the District where they may be employed. ...

A competent person should be appointed to superintend the progress and execution of the survey, with whom, through the medium of the Collector, the Assistants should correspond and consult in all cases of difficulty; and they should inform him from time to time of their proceedings, that he may be enabled to judge whether they are pursuing the most expeditious and advantageous methods.

When the survey is completed, the material should be brought down to his Office by the Surveyors, arranged, protracted, the Astronomical Observations computed, and the superficial contents of the different descriptions of the Ground ascertained under his inspection, a correct copy of the whole should be sent to the Collector, who will then be enabled to draw out his report and transmit it with the Survey to the Board.

This person may be called "Inspector of Revenue Surveys", and as the youth and inexperience of the Assistants make it necessary that a watchful eye should constantly be kept over them, more particularly at Madras, they should always while at the Presidency be placed under the immediate charge of the Inspector; the consequences without a check of this kind, at a place where there are so many idle persons of their own class, are easily foreseen [4].

This was endorsed by the Board of Revenue,

The appointment of a proper person for collecting and superintending the general execution of surveys...seems essential to the attainment of those public benefits which the Board looked for from this institution; for however well instructed the Boys may now be, it cannot be expected, by reason of their early age, but that they will be liable to errors at their first outset, which will require the correction of a more experienced person; the certainty that their labour will undergo revision will stimulate the boys to more diligent execution, and in the selection of a person for this task, we cannot overlook Mr. Goldingham; ...we therefore take the liberty to recommend that he be appointed Inspector of Revenue Surveys at the Presidency [5],

a proposal that was duly sanctioned [145].

The Board of Revenue wrote to the Collector of the *Jāgīr*, to whom other boys had been sent,

They must also be subsisted and clothed at the expence of the Company, and for these purposes, the Acting Collector at Dindigul stated Eleven Pagodas per month each would be sufficient; you will report whether this is found adequate for the purpose with you [6].

The boys sent out to the districts during the first few years were as under;

December 1796. To Dindigul; Charles Webb, Gardner, and Johnson. Of these Webb and Gardner died during 1798.

May 1797. To the *Jāgīr*.

[1] MRC. 16–9–96. [2] M. Rev. Bd. 6–7–97. [3] M. Rev. Bd. 22–12–96. [4] M. Rev. Bd. 22–12–96. [5] M. Rev. Bd. 22–12–96. [6] M. Rev. Bd. 15–5–97.

December 1797. To Devicottai, for work under the Superintendent of Tank Repairs; Tunbull and Allen; transferred at the end of 1798 to Dindigul, in place of the two who had died there.

September 1798. To Vizagapatam; David and Godfrey,

1798. Lincoln was placed under the Superintendent of Tank Repairs, and two others were attached to Major Beatson for a few months. James Ross was placed under Captain Mackenzie for his last year in the Nizām's Dominions.

September 1799. William Webb and Pope were sent with Malcolm's first mission to Persia, and at the end of the year several others were posted to the Mysore Survey under Mackenzie.

There was a steady demand for the services of these young men, and they were sent out to field work as fast as their school training was completed.

INDIAN EXPLORERS

Useful work was done by Indian surveyors, or rather explorers, trained by the surveyors who employed them.

The first record of such surveyor is of Ghulam Mohammed, sepoy officer, whom Camac sent in 1774 to explore the country between Bengal and the Deccan [30].

Thomas Call employed several Indians to collect information for his Atlas of India. He writes in 1783,

I have for a year and half past, employed 6 munshies[1] and 30 Hurcarrows[2] at my own expence, to travell through the different parts of India to collect information. ... This I did with the permission of the Hon'ble the Governor General[3].

And again,

I have by order of the Governor General employed Munshys to survey some Roads between Places well ascertained in the Map, and have procured some very useful information. The expence attending this mode of Surveying is trifling. I employed six Munshys and 24 Hircarrows for 18 months at the rate of 650 sonat Rupees a month, which, with the expence of Law charges incurred by a prosecution one of the Munshys commenced against me, in which he was non-suited, amounts to Rs. 12,600.

May it please your Hon'ble Board to order the Pay Master to re-imburse me this expence, and inform me if it be your pleasure that I continue to employ them at the same rate[4].

Government paid him the Rs. 12,600, but directed that these surveys should stop, as expences had to be cut down on account of general retrenchment [38].

Call also writes that Ewart had procured for him "several useful routes from Cossids"[5] during his stay at Nāgpur [42], some of which are still preserved;

Great Nagpore 1782. Route from Great Naugpore, Westward to Poonah, from the account of a Cossid, giving stages, and distances in Coss. Signed James Ewart. Similar route, Nagpore to Neermul & Hyderabad, 1783.

This bears a note by Colebrooke entered many years later. "The distances in this route, and party in the preceeding one, are great exaggerated"[6]. There are similar routes "from Nagpour to Oojein and to Asseer Gurh", countersigned by Ewart in 1782; which bear pencil comments, probably also by Colebrooke, that the distances are erroneous.

Burrow was another who collected routes through native agency; though it is not clear that they carried out any actual survey. In stating the establishment required for one of his journeys, he allows for "a Moonshy, at Rs. 25 a month", adding,

The last article is more necessary than at first sight may appear, as it is often requisite to send a Moonshy to make enquiries, and to take bearings, and to get copies of routes etc[7].

In his journal for 1789, describing his trip through Rohilkhand, he writes,

From here I sent my Pundits[8] to the Hills to get routes &c., and to bring such books and papers as I had been promised by an astronomer that I met with near Cossipore [161]. ... While I was at Anopsheer, my Pundits arrived from the hills and brought several different routes to the Comow Hills, Budrinaut, &c[9].

[1] *Munshi*, an educated Muhammadan. [2] *Harkara*, a messenger. [3] BPC. 6-10-83 (21). [4] BPC. 29-11-84 (53). [5] Letter carriers. [6] Fdbk. MRIO. M. 229. [7] BPC. 21-9-91 (15). [8] educated Hindus. [9] Journal, IO. Maps. MS. 5.

For his *Map of the Countries West of Delhi*, Wilford employed, between 1786 and 1796, Mirza Mogul Beg [234] whose surveys included "Chitraul or Hindu Kush", and extended "as far as the parallel of Multan[1]", and were supplemented by "a copious account, in Persian, of the Geographical and Political state of these countries".

It is not clear how far Pringle relied on sketches and information collected by the rank and file of his Corps of Guides [110–1] for he states in his *Book of Roads* that the routes given were all measured by himself. When the corps reformed in 1790, its function was to "obtain information about the country, especially with reference to roads and passes". Guides were no longer to be employed in procuring intelligence, but restricted to the performance of their duties as surveyors[2].

Several of Beatson's maps included information and sketches brought in by his guides [109–10] and when submitting his own maps in 1797 Allen wrote,

I have also the honor to lay before your Lordship, several maps, made entirely by the Native Guides, together with their own Field Books. ... They have examined, and made every necessary remark upon, near 5000 miles of roads in the Carnatic and Mysore country, which they have compiled into the form of a book of roads. ... I consider it a duty I owe to the Corps of Guides, who were employed in the field during the whole of the late war, to request your Lordship will transmit to the Hon'ble the Court of Directors their maps and field books, also their book of roads, which I have had translated into English[3].

REYNOLDS & HIS SURVEYORS

No one made greater use of Indian surveyors than Charles Reynolds. When attached to the Residency at Poona he had referred to "my Country assistant, moonshee, and interpreter", saying that the *moonshee* could "not be entertained on a less salary than 45 or 50 rupees a month"[4].

From 1793 he had a number of such surveyors scattered in every direction, and, in pressing for the continuance of his special allowances [218], he mentions as "the first and most considerable...and the only constant" item of expense,

the pay and rewards of the establishment of Native Surveyors which I have created myself, and whom, from the great difficulty I experienced in being able to select men fit for my purpose, it became impossible for me to discharge, whilst I continued to entertain any hopes of bringing my work to conclusion. ... At the time I was ordered round [to Bombay in 1794], ... these Native surveyors were all absent from me, and employed in distant parts of the Country, so that had I been inclined to discharge them it was then impossible; since my arrival on this side of India, they have all at different times joined me, and been immediately dispatched again on the same business. All these native Surveyors are at present employed in different parts of India; ... some of them at the Attock and in the Punjaub, some in Tatta[5] and in the Indus River, in different parts of Goozerat[6] and Marwar[7], and others in the Deckun and Tippoo's frontier, besides one just returned from Kutch, and four...on the eve of their departure [132, 219].

The expence of this part of my establishment in pay and rewards has already, since my return from Lucknow cost me upwards of Ten thousand rupees. ... In consequence of my own researches and the labour of these people, my stock of Geographical information is nearly, if not quite, doubled since my return[8].

Again, in 1798,

The remaining information necessary...is now carrying on by twenty-seven sets of my native surveyors, distributed throughout the various parts of India[9].

He carried some or all of these surveyors on the strength of his escort [302], and protested strongly when Government objected to his charging *batta* for them

[1] *As R.* VI (495, 534) also note on map MRIO. 7 (11). [2] W. J. Wilson, II (237). [3] MMC. 12–12–97. cf. "Sketches of roads and passes on Mysore Frontier, by Native Guides, and on south of Cauvery R.". A. Allen. Trichinopoly. May 1790. BM. 13907 (A, B, C). [4] Bo. S & Pol. 29–6–86, & 8–8–88. [5] Tatta, 35 P/14, then applied to whole of Sind. [6] Gujarāt, 46 A, B, etc. [7] Marwār, or Jodhpur, 45 B, F; Cutch, 41 E, I, etc. [8] Bo. MC. 10–6–96. [9] DDn. 146 (23), 2–2–98.

whilst he remained stationary at Surat [282]. The Directors were anxious about his large expenditure, and ordered that it should all be regularly charged to Government and audited;

We do not clearly understand what is the state of the Country Surveyors employed by Lieut. Colonel Reynolds, nor the nature of the disbursements, which he alledges have already exceeded by more than Rupees 70,000 the amount of his Allowances. If the native Surveyors are to be so employed...the expence should be regularly paid by the Company, and not defrayed by an Individual at his own expence, who would thereby have a Claim on the Company hereafter to an unlimited extent, without any vouchers for the Expenditure[1] [282].

Reynolds later explains that,

The expence...has not been brought against the Company, by reason of the Hon'ble the Governor's dislike to it, from a promise I had made him that no further burden should be laid on the public, and that the people then out, and charged for, should be struck off as they came in. ... Command of retrenchment...had been made on account of my people's batta, of between four and five hundred rupees a month; this took place when my receipts...were unequal to my disbursments; on explaining this to Government, I was authorized...to draw for the extra sum under the strictest rule for Military expenditure, declaring the charge...upon honour.

It was at this time, and not before, that the company bore the whole of the expence incurred by my enquiries. The people then charged for, having some of them since returned, ... the expence has been gradually decreasing. ... The expence resting on myself is for people employed on the Indus, Zemaun Shah's frontier, and a part of Malwa, but as these have been despatched since my promise to the Hon'ble the Governor, they are not included in my contingent bill. ...

None of the native surveyors, including the people it has been necessary to detach with them, have cost Government more than 150 Rupees a month; ... no other contingent charges have ever been made. ...

It was impossible for me of course to investigate every part of so extensive a country personally, and hence arose the necessity of employing Natives. The propriety of this measure has had for its support the authority of Government, and the sanction of the Hon'ble the Court of Directors. ...

The employment of the Native Surveyors was indispensable, and I should, had I neglected to avail myself of the labours to the utmost extent, have justly stood accused of neglect of my duty. These people are of course at present employed out, and...I do not expect the earliest of them in before the month of November next, and several of them considerably beyond that period[2].

One of the monthly bills for these surveyors reads,

The sum of 995 rupees, being the balance over and above my receipts, and required to pay up the monthly allowance to Twenty Setts of Native Surveyors, employed by me for the completion of my Geographical work in different parts of India, including the extra people employed with them, on account of the difficulty of travelling from the present confused state of the country[3].

When he handed over in February 1807, he left his successor a note,

One of these Surveyors has lately returned, and I have taken down his information. ... There are still remaining four of my Surveyors out; ... one of them has a survey to make of upwards of 25,000 [*sic*] miles, the surveys of the others are less extensive; whenever these people arrive, ... take down their information[4].

He considered the taking down and arranging of the reports a matter which required much care;

The surveys of those Natives now out cannot be rendered of use if they are taken down and translated by any other than a person conversant with the business[5].

He took a personal and fatherly interest in his men, and made ample provision for their welfare after he should leave the country, though the Directors eventually took over this responsibility, writing out in 1808,

As Colonel Reynolds had represented to us that, in order to stimulate the exertions of the Native Surveyors employed by him, he had agreed, on the conclusion of their labours, to give them a pecuniary remuneration, and had accordingly on leaving Bombay lodged in the hands of his attornies...the sum of Rs. 22,000, to be applied in payment of annuities to the Native

[1] CD. to Bo. 29–5–99 (30). [2] DDn. 146 (33–42), 17–4–1801. [3] Bo MC. 5–12–1800. [4] Bo MC. 15–6–1807. [5] ib. 13–1–1807.

Surveyors for the remainder of their lives, and the principal to go among their successors; we have resolved to relieve him from the charge, for as the Surveyors were employed on a Great Public Duty, it is but reasonable the expence of pensioning them should be born by the Company[1].

Effect was not however given to this laudable purpose till very many years later[2].

LASCARS & FOLLOWERS

When Rennell set out on his first survey in 1764, he took with him 11 Lascars and 11 *motias* or porters[3].

In 1767 De Gloss had "20 Burgundasses and 5 Harcarras" for his survey of Bihār, besides private followers and an escort of sepoys [25].

In 1768, on Rennell's recommendation, Government approved the following establishment for the Surveyor General;

1 Tindal	Rs. 10			2 Watermen @ 4	Rs. 8		
10 Lascars	„ 60	Rs. 70		Tent & Moonshy	30		
2 Duffadars	... ...	12		4 Peons @ 2	16		
34 Coolies @	Rs. 4 ...	136		5 Hircarrahs @ 6	30	Rs.	318
4 Beldars[4]	„ 4 ...	16					

The establishment for a surveyor differed only for the last two items which, stood "2 peons Rs. 8, 6 Hircarrahs, Rs. 30", with total Rs. 310.

The duties of the lascars were given as

For the Chain	... 4	Tent	... 1	Signal Flag	... 1
Theodolite & stand	... 2	Powder	... 1	Spare man	... 1

whilst the duties of the 34 coolies were,

For carriage of a tent	... 11	For carriage of Plans, Instruments,	
„ Powder	... 2	& Drawing Table	... 8
„ Flags	... 10	Spare Men ...	... 3

Besides the above, the Surveyor's necessaries require 26 coolies, for which no allowance is made; this article falls particularly heavy on the Subalterns, whose allowances are so small.

I have found it necessary to employ 25 Hircarrahs during some surveys; but in the known parts of the Country, on a medium, 6.

The Surveyors are at the monthly expence of 48 or 50 rupees for Bearers, for which no allowance is made in the new regulations.

The expence of Coolies might be considerably lessened by carrying the Tents &c., on Bullocks, but this method of conveyance is remarkably tedious, and occasions the loss of much time[5].

In 1777 establishment was increased to allow each surveyor[6],

1 Tindal & 10 Lascars	...	Rs. 82	Carriage of Tents	...	Rs.	30
2 Head Coolies & 40 Coolies	...	Rs. 216	Moonshy, 15; Interpreter, 15	...	Rs.	30
Hircarrahs	...	Rs. 50	2 Watermen @ 9	...	Rs.	18
			Total	Rs.	426 [276].	

The establishment which Burrow asked for on his Astronomical Survey was[7]

24 Bearers for palanquin	Rs. 100	1 Beestie	Rs. 6
20 Mooteas and Bangies (carriers)	Rs. 80	1 Jarrawalla [sweeper]	4
2 Hircarrahs ...	10	6 Calashies	33
		2 Musalchees	8

This is the first time that the term *khalasi* is found, the term *lascar* being at that time the usual one applied to a "handy man" in regular service.

The Madras regulations provided for

one Tindall & 8 Lascars to be supplied by the Chief & Council of that Settlement under which the Surveyor may be employed, and Batta to be drawn for them while on Service, agreeably to the Regulations. Two Hercarahs to be supplied by the Chief...& no charge therefore to be made for them[8].

[1] CD. to Bo. 7-9-1808 (11). [2] Bo MC. 18-10-20. [3] La Touche (9). [4] Diggers, or Jungle-clearers.
[5] BPC. 11-10-68. [6] BPC. 28-4-77. [7] ib. 21-9-91. [8] MPC. 1-11-76.

When Irwin was appointed to survey Blacktown [94], he was allowed "two *Conicoplies*", and four *peons*[1]. A *conucopula* was a Madras institution, whose business it was to keep the account of household expences, and to pay the servants' wages, and tradesmen's bills[2].

We find very few references to men regularly trained for survey, and in 1788 after only two years in the country, Topping carried his triangulation 300 miles down the east coast with no assistance except from general service lascars, and when measuring his base-line he did not use the stands for his measuring-rods as he could not expect the lascars to manage them successfully [102, 191].

A few years later, when running levels through the Kistna delta, he found that his men responded to patient training;

In justice to these poor people, I must confess that no set of men are more to be depended upon than they are, nor more regular and exact in the several offices assigned them, when once they are brought to comprehend what kind of duty is required of them [192].

When Beatson took over charge of the survey four years later, he tried to get hold of Topping's squad of men,

Major Beatson...applied to the Military Board for nine lascars belonging to the Arsenal, who were employed with the late Mr. Topping, and whose names are mentioned in the accompanying list, but he has been informed that an order of Government is necessary. ... These men, being experienced in the business of levelling and surveying, would be extremely useful to Major Beatson, whilst employed in the Circars. ...

I am therefore directed by the Board to request that an order may be sent...that all, or at least half-a-dozen, may be spared to him. During the time they may be employed on the survey, their pay and batta will be paid from the Revenue treasury, and when the investigation of watering the Circars is completed, they will be returned to the Arsenal[3].

Artificers were a useful addition to the camp of a surveyor, and in 1798 Mackenzie was glad to get sanction for "1 carpenter, 1 smith or brazier, for repairs[4]".

Rates of pay on the Bombay side seem to have been a good deal higher than in Bengal. Reynolds writes to the Resident at Poona in 1786,

The rate at which common servants or coolies have received their wages every since I left Bombay on our journey to Bengal, till the present time, is well known to you to have been nine and ten rupees a month for each man, whilst a Hallalcore [*harkara*?] receives eight, as is still the case; it cannot be supposed that I can possibly procure servants in an infinitely more respectable Line of service at a lower rate[6].

The staff sanctioned for the Surveyor General's office at Calcutta in 1788 was

3 Hircarrahs	@	Rs. 5	...	Rs. 15	1 Darwan	...	...	„	4
3 Lascars	@	Rs. 7	...	„ 21	1 Siclegur[6]	...	...	„	4[7]

[1] ib. 20–9–71. [2] Ives, (51n). [3] MRC. 3–3–98. [4] MMC. 3–3–98. [5] Bo S & Pol. 29–6–86.
[6] Polisher; sword or knife grinder. [7] BMC. 10–6–88.

CHAPTER XXII

INHABITANTS & OFFICIALS

Bengal in Rennell's Time[1] — *India at Large* — *Military Escorts* — *Posts & Communications.*

WHEN Rennell started his surveys Bengal had not yet come under the regular administration of the Company's servants, who were still but strangers in the land, occupied with commerce and money-making, with but a few troops for the protection of their factories or to support the collection of revenues; the bulk of the small army was fighting beyond the western frontiers [136, 266].

Local *zamīndars* were, for the most part, independent of all control, except for the payment of revenues to the Nawāb's officials, whose exactions were often quite out of proportion to what the *zamīndars* were able or willing to pay; defiance and armed resistance to authority were part of the day's work.

On his journey up the Brahmaputra in 1765 Rennell writes home telling that he is engaged in tracing the sources of the river,

but I shall have a number of barbourous [*sic.*] nations to pass through, and some of them are extremely jealous of Europeans[2].

Travelling by boats however, he tells of no incidents till he came to the frontiers of Assam, where he was prevented from landing, and could proceed no further. It was after Richards had joined him, and they had discharged their boats preparatory for the march across Rangpur District [23], that they met with the first serious trouble;

From 1st January to the 9th [1766] I sent all round the Baharbund Countrey[3] to hire Coolies and Bearers, but was not able to procure a single one, although I offered a sufficient Price. The Countrey People like wise refused to supply my People with Provisions, and upon enquiry I found it was all owing to the Villiany of the Dewan of Olyapour [20, pl. 14]; who had threatened to punish any person who should supply me with Men or Provisions. Upon this wrote to the Dewan...to know the Truth of it. ... His Answer was that the People might sell me Provisions if they chose it, but dared me to take any Coolies. ...

I immediately applied to the Resident at Rungpour requesting his assistance in procuring Bearers & Coolies. He sent me a considerable Number from Rungpour, but as they deserted on the Road I received no more than 18.

The 10th in the morning we left Curygong[4], having prest what Coolies we could at that Place, and proceeded by way of Olyapour in order to explain matters with the Dewan. We arrived in Olyapour late in the Night.

I sent a message to the Dewan this Night & another in y^e^ morning of y^e^ 11th requiring him to make his appearance but he treated them both with great indifference. About 8 next morning I went with Mr. Richards & 16 Sepoys towards his Countrey House under cover of a thick fog, but he had got intelligence of our March, & was gone before we entered the House. I informed the servants that if they did not produce their master I should set fire to the House, which was accordingly done, & we retired to our Baggage on the South side of the Teesta.

The fire was extinguished immediately after we left the House.

Although the Dewan had not Resolution enough to defend his House, yet he followed us immediately with 150 Burgundasses & 300 Villagers some of which came close to our Rear & began to fire at us, which fire we returned in single shots for upwards of 6 miles, they being afraid to close with us & retreating whenever we made a Stand[5].

[1] cf. Long: *Rural Bengal*; *Rangpur Dist. R.* Vol. I. [2] HMS. 765 (31-8-65). [3] *Ben. Atlas.* Map V. 78 G/9, 10. [4] Kurigrām, 78 G/9. [5] La Touche (61-2).

The very next month they fell in with a detachment of the Company's sepoys in pursuit of a band of *sanyāsi* raiders[1] near the southern border of Cooch Behār [23]. There was a dispute raging about the succession to the chiefship of Cooch Behār; the local people had appealed to the English for assistance against the Bhutias, and the latter had hired the services of these *sanyāsis*. Rennell gives the following account of the episode;

We now found ourselves on the Western Bank of the Neelcomer or Curesa River[2] which is a Boutan River passing near Bullerampour[3]. ... It joins the Durla near Curygong. ... We found that the English Detachment crossed this River during the Night before our arrival & that the rear had not passed over many Hours. The Sannashys were reported to be marching towards us, & had several Detachments posted in different Villages to the Northward & North East. ... We accordingly crossed the River Neelcomer & marched for Curesa[4]. ... At Curesa I learnt that a party of the Sanashys Horse had been routed that morning. ... I stopped at Curesa to refresh my People & during that Time...heard a firing of Cannon & Musquetrey to the NE.

We set out in the afternoon & marched 6 miles to the NNE. & found the Detachment under the Command of Lieut. Morrison[5] encamped at Bouter Haat, having that Forenoon defeated the Main Body of the Sanashys. ... Morrison had 90 Sepoys Rank & file; and the Sanashys were 700 strong & near 150 of them armed with English Musquets. We halted with Morrison this Night (of the 20th February) [1766].

The next morning early Morrison set out in quest of the Enemy, & my Sepoys being joined with his, I acted as a Voluntier under him. We marched 8 miles this Forenoon, and then halted at Santashpour[6] to refresh the Troops. We continued marching all the Afternoon to the S & SE. till we came in sight of the River Baramputrey. ... About 4 we entered the village of Deenhotta[7], where a Party of the Enemy had posted themselves, or...had sat down to rest themselves; ...they made a desperate effort to defend themselves. ... In this Skirmish I had the misfortune to be surrounded by the Enemy, & received several cuts from their broad Swords, one of which threatned my Death[8] [23].

Morrison spent the next two days pursuing the *sanyāsis* down to the banks of the Durla, where their leaders escaped to Ulipur, of which we have heard already [291]. Besides Rennell's own serious wounds, Richards was slightly wounded, and what was much more serious, the Armenian assistant was killed [283].

In December 1770 he had trouble with a *zamīndar* of Rājshāhi District, which he thus reports to the Council at Murshidābād;

I am employed on a Survey...on the North side of y^e^ Ganges, & halted near Pulash[9] the 5th Instant at Noon. A few Minutes after our Arrival the Villagers came arm'd, & threatened to fall upon Us. I asked them if they had any Complaints to make. They abused me, told me no, & insisted that I should go away. We soon dispersed them without making Use of any Weapons, as I never suffer a Sepoy to fire 'till Matters come to Extremity. Whilst they were in the Action of running away, We caught one of them, a Burkandass, who had entangled himself in the Jungle. I enquired of him who the Village belonged to, & (after disarming him) sent him with a Message to Cadder Beg, informing him of my Business in these parts.

From this Time none of my people enter'd the Village, altho' everything seem'd quiet; yet about two Hours afterwards, a Mogul (Caddar Beg) appear'd on Horseback, & with him a very great Rabble, some of them armed with Matchlocks, & the rest with Pykes & Swords etc. Without sending Me any Message, he came within Call & told me that He was come to fight me. I was obliged to have Recourse to my Sepoys, but hoping to end the Matter with little Bloodshed, I aimed a single shot at the Mogul, which however missed him, but killed a Man close by him. This had the desired Effect of making them retire to a greater Distance; but they kept us in a continual alarm by sending Parties into the Jungles on every side of Us. During this time the Mogul remained in Sight, & sent me several insolent Messages; one of them in particular so full of Abuse & Menaces, that I thought Myself fully authorized to chastise the Messenger, which I did; the rest contained his hints of Independence, together with Orders for me to depart. To one of these I replied by showing the Messenger the Sepoys, Arms, and Camp Equipage, by which he might be assured that We belonged to

[1] For account of these *sanyāsi* fakirs, *v.* Ghosh. [2] Probably the old Toresha R. or Torsa, now disappeared. [3] Balarampur, 78 F/12. All these places are shown in *Ben. Atlas* Map V. & *Companion Atlas* [pl. 44]. [4] 3 m. NE. from Fulbari, 78 G/9. [5] Dennis Morrison (qv). [6] Santoshpur, 78 F/12. [7] 10 m. NE. of Kurigrām, 78 G/9; not the present Dinhāta on railway. [8] La Touche (73–4). cf. *Hobson Jobson* (872) Ghosh (37–9) & HMS. 765, 30–8–66. [9] 8 m. NE. of Godagari, 78 D/6. *Ben. Atlas.* Map VI.

the Company, for the Mogul affected to believe that We were Robbers. Even after this he insisted in sending his Messenger, & using threatning Gestures, 'till, finding it had no Effect, he fell into the opposite Extreme, & began to aplogise for his Behaviour, which he imputed to Ignorance of my Station & Employment [1].

The Council thereupon called upon the *Naib Duan* to summon Kadir Beg to Murshidābād to answer for his conduct, and the records continue,

The Naib Duan reports Cadder Beg has been brought in, a Prisoner, and that upon comparing the account of the affair in Question with the representations received from Captain Rennell, it appears that Cadder Beg had been guilty of the insolent and outrageous behaviour which Captain Rennell sets forth. The person mentioned by Captain Rennell to have been killed is not dead.

The Board decide that He should be way of punishment for this offence, and in order to deter others from attemping to impede or molest Gentlemen employed in the Public Service, be drummed thro' the City of Moorshidabad, and afterwards the village of Pubaw wherever the offence was committed, and then proceed to Dinagepore [2], or wherever Captain Rennell may be, to ask pardon of him for his culpable behaviour [3].

The following year Rennell had further dealings with the *sanyāsīs*, and in February 1771 reported from "Belcuchy [4], then in Rājshāhi District [5],

There is now in this part of the Country a large Body of Fakirs who are laying all the principal Towns under Contribution. They were yesterday at Lutchinumpore, 4 Coss from this place, and after receiving two hundred Rupees from the Gunge Darogah, marched northward into the Puckaryah Districts. By the Accounts I have from an intelligent person whom I sent to watch their motions, they are about a Thousand in Number, and tolerably well armed; they came from the Western Provinces about a month ago, and traversed the Denagepore and Goragaut [pl. 14] Districts in their way.

As there is no force in this part of the Country I imagine they will continue in it, till they have plundered all the principal places. I have met several of their detached parties, which are indeed scattered over the whole province of Radshy and Goragaut. I have enclosed a Route to this place and a Sketch of the Couutry, in case you may think proper to send any force after these miscreants [6].

The Council at Murshidābād at once sent two companies of sepoys from headquarters direct to Rennell, and ordered the Supravisors at Rājshāhi and Rangpur to get into touch with him, and to send one or two further companies. Rennell was directed to take command of these troops and expel the *fakīrs* from the province [7]. On March 1st he was able to report from "Seebgunge" [8],

I join'd Lieut. Taylor's detachment the 24th ultimo, and followed the route of the Fakeers towards the Hoannah Divison, they retreating that way. On hearing they were passing, Lieut Feltham with the Rungpore Detachment, taking road to Goragaut and Gobigunge [9]; surprised their camp on the morning of the 25th, and after a short skirmish, effectually dispersed them, taking their Camp and Baggage, & a few prisoners. Their Chief Sheik Munjinoo fled on Horseback to Mustan Gurr [10], where he was joined by 150 of his followers, all disarmed and many of them wounded.

The rest to the number of 2,500, are dispersed in such a manner that two of them cannot be found together, so that it is impossible to pursue them; ...They all threw away their arms in their Retreat, and the villagers falling on them killed great numbers.

I marched to Mustan on hopes of taking the Chief prisoner, but on my arrival found the place empty, and was informed that he went off with a few followers on the road towards Purneah. Upon this I sent a Jemedar's Party after him with orders to follow his road four or five days journey, and I am in hopes that the Jemedar will be successful as Munjinoo is diseased and cannot travel fast. ...

As the service on which I was sent is now finished I have left the command to Lieut. Taylor; I shall return to the business which I was before employed in [11].

[*Note*. 165 years after this adventure of Rennell's the *Statesman* published a letter from Lucknow, dated March 6th 1936, "Four hundred *sadhus* recently raided C– village in the Sitapur district, on the refusal of the villagers to supply them with fuel free of charge. Overcoming all resistance, the *sadhus* let loose the villagers' cattle, set fire to the houses, destroyed the standing crops and took away property. ...

[1] Firminger, II, 9–12–70 & La Touche (137–8). [2] Dināj̄pur, 78 C/10. [3] Firminger, II (172). [4] 78 H/11, now washed away by Jamuna R. [5] *Ben. Atlas*. Maps VI, IX. [6] Firminger, III, 14–2–71. [7] BTer C. Moorshedabad, 14–2–71. [8] Sibganj, 78 G/8. [9] Gobindganj, 78 G/8. [10] Mahāsthān, 78 H/5. [11] Firminger, IV (58–9) V. 7–3–71 & Ghosh (44–45); cf. Cardew (36).

The villagers are panic-stricken, as they have reason to believe that the *sadhus* are planning another raid on their village in larger numbers on their return.]

Whilst Rennell had his adventures in what might be called the home districts, his surveyors working on the western frontiers had frequent adventures amongst the more primitive tribes of Chota Nāgpur and Jungleterry [34 n. 9].

De Gloss has referred to the timid folk who lived in the jungles along the banks of the Son [25].

In 1771 Carter had to apply for a reinforcement of sepoys, to enable him to prosecute his survey through the Herboe [1] district, where the *chooars* [2] had attacked his detachment without provocation. The Supravisor of Birbhum District reported,

This district is inhabited by a Sett of independent Chouars, who pay no Revenue to the Company, but are very troublesome Neighbours, as they make frequent Incursions into the Borders of Beerbhoom, and carry of large Quantities of Cattle and grain. ... I beg leave...to Represent that as the Herboe People attached Captain Carter's Detachment without any previous Provocation whatever, I Think they ought to be made sensible of their Presumption, and that this District should be obliged to pay a proper Revenue to the Company [3].

After an extra company of sepoys had been sent up [300], the Supravisor was able to report,

The Herboe District being now entirely reduced by Captain Carter's Detachment, the Chouars in those parts have been quiet for some time past; but when Captain Carter leaves that Country, I fear they will be troublesome again [4].

About this time Camac, who was in command on the south-west frontier [30], suggested a survey through Chota Nāgpur and Palāmau, and wrote to the Council at Patna,

Ever since the conquest of Palamow, I have found a great alteration in the attention of the Hill Rajahs, and am well convinced that if proper uses were made of them, very great services would accrue from it. Of all these the Nagpore Rajah is the most friendly. In conversing with his people I could not but be astonished at the facility which they seemed to make of passing to and from the Deckan, and of the nearness of Aurungabad [5], Hyderabad, and Cuttack, to Nagpore. I could not but think at the same time on the benefit it would be of to the English, who having two such considerable countries, know much less of the communication between them than the French. The remainder of Mr. Law's people after their defeat at Bahar went by these Roads, and there is reason to think an intercourse is still carried on by them with the Northern Powers by these means [27].

We have often experienced the extreme diminution of our Troops and the great expence and difficulty of sending them by sea, while the Road would be nearer and attended with scarce any objection or trouble [40–1]. ...

The Gautwals and Headmen of Palamow are now all come in except one or two who are left without followers, so that you may look on the country as fully reduced [6].

The following year Carter was sent up by Government to survey the road to Rāmgarh [7] and he greatly alarmed the country by unwittingly bringing with his followers, a claimant to the chiefship; Camac had to appeal to the Provincial Council at Patna to order Carter to surrender this pretender, and represented that,

If it shall be found expedient to survey these Hills, I think it advisable that the person sent should act with my advice, which shall be such as will give least umbrage to these wild people, who being nearly Independent are easily alarmed [8].

The following report describes an incident of Thomas Call's survey in Midnapore district in 1774 [33]; he had two companies of sepoys as escort, and the officer commanding them writes that, after a brush with the local people, they had been

obliged to leave off surveying in order that one might get thrcugh the jungle as soon as we possibly could & get on a plain, which we did about 12 o'clock, and here we found that they had get possession of a tank, the only one; however we soon took it from them. I then halted to refresh my people, clean my arms and dress the wounded. ... In the morning at daylight we proceeded on route, Mr. Call pursuing his survey; as soon as we got in the jungle they fired at us from all Quarters, my Detachment partys kept them off for some time; at

[1] or "Hendooa" now Hansdiha, 72 P/2; *Ben. Atlas.* Map II. [2] Probably Santāls. [3] Firminger, III, 5–2–71 & 1–4–71. [4] Firminger, V (128), 15–4–71. [5] Aurangābād, 47 M/5. [6] B Ter C. Patna, II, 30–12–71. [7] 73 E/10. [8] B Ter C. Patna, III, 19–3–72.

last they crowded upon the rear so fast I was obliged to face my people about to drive them off, which I very soon did dropping near a hundred of them. ... I must beg you will excuse my not giving you every particulars, for Mr. Call & myself are in a feavor and not able to hold our heads up. Mr. Call has received orders of the Surveyor General to alter his route. ... I have written to the Rajah at Barru Bhoom [pl. 14] & to acquaint him that we were coming thro' his District by order of the Government to Survey the road, not in any Hostile manner, and that I would be glad if he would order the Riots to supply me with what Provisions I wanted & that I would take care that they should be paid for what they brought me; he did not chuse to send back an answer but kept [the messenger][1].

The following were the instructions issued to Pringle for his survey of Jungleterry [34];

You will as far as possible, prevent all causes for dispute in the Districts not under my authority with the Zemindars or inhabitants; if they should oppose your surveying, & you think them sufficiently strong to prevent it by Force, you will immediately write to me for assistance, and not incur any risk of being obliged to retreat by attemping to force a passage with too inconsiderable a number of men.

In the districts under my authority, you will not meet with any opposition, I trust; but if you should, advise me, that the Leader of the Offenders may be brought to Justice, and during all your march, give particular orders that no act of Oppression may be exercised on the Riots, without the full value being paid. I shall order an escort...to join you at this Place[2].

Shortly after, Pringle got into trouble for interfering in revenue matters; whilst making his headquarters at Deoghar[3] he undertook responsibility, on behalf of the native farmer of revenues, for the payment of certain tolls; the farmer fell into arrears in his monthly payments, and

quitted DeoGurr without so much as acquainting me where he was gone, or when he would return to his Duty. ... Convinced from this behaviour that he never meant to return to DeoGurr, ...I, considering myself as accountable to Government for the amount of the Revenue, took the Collections into my own hands; ... I ordered his Papers and Effects to be secured, in order to investigate his accounts, and obviate as much as possible the Loss I must naturally sustain. I was the more induced to use these rigorous Measures from the Number of Complaints I had heard against him for repeated acts of oppression and Injustice, which in the End would have ruined the Collections, and reflected Dishonour upon the English Government[4].

Although he was supported in his action by his commanding officer, the Supreme Council took a serious view of Pringle's behaviour, General Clavering noting.

I think his becoming security to Government for Pertaub Sing's paying 7,000 rupees, taking the Collections into his own hands and afterwards seizing his papers and effects, Entirely unjustifiable. ...

And the Governor General agreed,

As for Ensign Pringle, I deem him highly culpable in engaging in a Business so foreign from the duties of his profession; and am of opinion that the proper and most effectual example which could be made of such an offence would be to order his immediate removal from his present station to some other Corps at a distance from it[5] [35, 269].

It would not be correct to give the impression that Rennell and his surveyors were in constant conflict with the people of the country, as this narration of a few incidents might imply; the work indeed could not have proceeded had this been so; on the contrary the Council were glad to commend "his just and inoffensive conduct to the People of the Country"[6].

The following extract from a journal of Showers [29] illustrates the general willingness of the people to help, and yet the difficulty the surveyor found in getting exactly the help he wanted;

The Fauzdar...came to camp and brought along with him two guides; he seems to know very little of his own country, and could give me no information of the distances of the inland Towns. ...

Being unable to obtain any just account of the distances that these Parganas extend from the river, I have thought it improper to insert the confused description I receive from the guides, who are only acquainted with the names of the villages near the Gompty, and are obliged to be changed every two miles, their knowledge not extending further[7].

[1] *Midnapore Dist. R.* III (335), 2–4–74. [2] Browne's instructions dated 18–10–74; BRC. 7–4–75 (9). [3] 72 L/10. [4] BRC. 24–5–76 (19). [5] BRC. 28–5–76. [6] B to CD. 17–10–74 (60). [7] Orme MSS. 8 (3).

On a journey down to Nāgpur the same year, 1768, Showers records that he "met with every civility" on the way[1].

INDIA AT LARGE

It was the general rule that surveyors should be subordinate to the civil officer in charge of the country in which they were working [272–3], except, of course, in the case of officers surveying the route of a military detachment. The following notice to the "Chief of Masulipatam" advises him of the appointment of an officer to survey his district;

Notwithstanding it was necessary for the better executing the Business of the surveys of the Circars to direct the Chief Engineer to furnish the Gentlemen appointed for that service with particular instructions for their conduct therein, yet it was not intended that those Gentlemen should be independent of the Chief Council of the Settlement in the Districts in which they may be employed.

You will therefore acquaint Captain Stevens that notwithstanding the instructions he has received from the Chief Engineer, he is to consider himself as acting immediately under your orders; that he is to report to you and the Council from time to time the Progress of his survey, with his remarks and Observations, and to transmit to the Chief and Council his Plans and Charts to be forwarded to us[2].

At the same time the civil officers were directed to furnish the surveyors "with every necessary assistance" [92].

One of the most remarkable features of the work of the surveyors was the manner in which they were able to travel with safety through unknown parts of the country with but little molestation; and this was true even of countries whose rulers and inhabitants were the most jealous or unfriendly; there is not one case to report during the 18th century of any murderous attack on a surveyor. In the first instance no surveyor ever ventured into a country where access was definitely forbidden, just as Rennell turned back from the frontiers of Assam in 1765 [20, 291]; secondly, surveys of hostile countries were invariably made under the protection of a military column; and thirdly, before a surveyor could enter any foreign territory, he had always to be provided with a *parwāna* or passport [59,128]; once provided with this he was seldom molested, and then only if he strayed unwittingly beyond the limits specified; fourthly, the provision of escorts protected the surveyor from the attacks of bandits or dacoits.

The following extracts from the journal which Mr. Thomas kept from Nāgpur to Cuttack in 1782 [39] give a fair idea of the adventures to be encountered when travelling off the beaten track.

January 28th. Left Nagpore on my return. By Moodahjee's[3] order, Ram Pundit, Rajah of Cuttack, sent 8 horsemen with me, & I have also a Naig and 6 sepoys of Mr. Chapman's guard. ...

February 1st. Carried hence 3 days' provisions for men and beasts to support us through the Nuctee Pass. ...

3rd. Delay by Elephants; Bildars clear the forest for the Elephants & Camels to pass. ...

4th. Kept in alarm all last night by Tigers. ...

5th. Kyrahgur. Disturbed again all night by Tigers. ...

The Kyragur district is reckoned the extremity of Moodajee's Raj, and that of Bimlajee begins...on the Cahcurrah Mullah which divides the two Rajes. The Kyragur Jemadar declares himself independent of either Raj, and would give me no guides, nor read the Rajah's passports. ...

8th. Robbed last night at Lecknow of my ring, Gold watch, chain, and key; Crest cut on a cornelian, crest on an emerald, one pistol, stock and buckle, and other things, at least Rs. 1,500. ...

9th. About two Coss from Dhiggy, a nullah bad for Camels; at Curmindah, a village two Coss before I came to Dewreah, the villagers, after I had passed the Naig, plundered my

[1] Orme MSS. 4 (97–103). [2] MMC. 24–4–73. [3] Marātha Rāja of Nāgpur.

people in the rear, which obliged me to return, when...Naig drawing his sword, and the rest beginning to fall on my people, I fired a charge of bird shot at the most distant, to intimidiate them, which it did, and the greater part took to their heels.

I then ordered the Naig and another leader to be seized, and brought them with me to Dewrah, but dismissed them unhurt on restoring the things they had taken.

10th. Guniss Pundit came to get the arms, my people had taken the day before, restored; I told him if he gave me a guide I would send them back by him, but he gave me no guide, tho' he promised it; the arms therefore remain with my people.

12th. Halted. The Jemadar behaved very civilly, came to see me and gave chokee and guides. I gave him two Turbands and at his request returned the arms taken at Cormandah.

14th. Sarongur [1], large place. Rajah came see me and gave me three kids, rice, &c.; I gave him half a piece of Crimson Silk which Moodajee gave to me, and Rs. 5 to his servants. He also give me Chokies and Guides, and desired me to tell the Governor General that he had written to him to stay and take care of Mr. Elliott's grave. ... He says that Chammojee's people destroyed the garden at Mr. Elliott's Tomb, but he intended to repair it. I offered him money for that purpose, but he refused it, saying he would certainly do it at his own expence [2] [39–40].

The most remarkable instance of the immunity of a surveyor is that of Charles Reynolds, who spent three years travelling backwards and forwards through the heart of India, through the territories of the various Marātha chiefs and of the Nizām. He invariably travelled with adequate passports; but these gave no permission to survey, and both Reynolds and Malet, the Resident at Poona, were most anxious to prevent the Marāthas getting to know the real purpose of all these journeys. When submitting to Government his first map, at the end of 1787, Reynolds particularly asked that it should not be published [127], and this request was repeated by Malet;

Permit me to solicit your Lordship's attention to the necessity of stopping the publication of any of Captain Reynold's journies with me, or procured by my means during my residence at this Court...as, should such publication come to the knowledge of this Government, which I think very probable from the inquisitiveness of its spirit, it certainly would have reason to reproach us with a deviation from that candour which we profess [3].

The Directors agreed as to the impropriety of publishing Reynold's survey at the time.

Reynolds wrote in again after his trip to Madras [128];

My present Trip has been productive of much interesting information, and I have purposely deviated in the Nizam's country from the established Roads, to try the practicability of a full and complete Investigation, without attracting the notice of the Government or any of its officers, and it has fully answered my most sanguine wishes. I have been most cautious since I came into the Maratha country, and have kept [to the] High Road, being well aware of the prying and inquisitive turn of the Peshwa's Government. ...

The facility with which I make my journies unnoticed by the natives, whose curiousity is not easily raised, particularly as I make use of no Instruments whatever before them, and merely pass through the country as a Traveller, convinces me...of the practicability of completely effecting my scheme. ... From the time of my leaving Poona to this period, I have never once had occasion to produce any of my Purwannahs, either from the Nizam's or Marratha Government [4].

In preparation for a second visit to Hyderābād, Reynolds asked the Bombay Government for a letter to the Resident;

I beg leave to submit to your consideration the propriety of my having a public letter to him to the following effect, " Captain Reynolds is despatched by us on business which he will communicate to you ". It may be necessary to assign some reason to the Nizam's Minister for my journey, and in that case the producing a letter from Government would remove every suspicion of my employment, and insure my safety back [5],

Malet was far from happy about this journey, and told Government that,

I acquainted him that the repetition of his journies must rest on many precarious contingencies. ... I am at a loss clearly to comprehend on what footing the journey which... Captain Reynolds is now on the point of prosecuting to Hyderabad will be undertaken, as at present it appears intended to be performed without the knowledge of this court. In that

[1] Sārangarh, 64 O/2. [2] Journal, MRIO. M. 163 (40–4). [3] BoS & Pol. 9–1–89. [4] BoS & Pol. 3–4–89. [5] BoS & Pol. 23–9–89.

case, furnishing him with a guard from my detachment, ...would reduce me to a Dilemma, if called on here to account for his journey, since I should neither be able to disclaim a knowledge of it, nor to answer satisfactorily as to the authority by which it was undertaken [1].

The Governor General had by now become disturbed by these journeys, and wrote,

I am so unwilling to alarm the jealousy of the Marrathas that, unless Captain Reynolds can point out any important object for another excursion, I do not wish that further application should be made at present to the Marrathas for that purpose, and he may in the meantime employ himself in arranging and protracting the Surveys that he has already made [2] [128].

Reynolds' journeys were not however entirely without adventure, and the following extracts from the journal of a fellow traveller tell of incidents on his journey from Lucknow to Bombay in 1794 [55];

May 10th, Chambal River [3]. Captain Reynolds and myself marched about 3 o'clock, ... Fight between Reynolds's servants and escort and some villagers, owing to one of Reynolds's hircarrahs having siezed a young man, Rajpoot, to act as guide. ... One of Reynolds's khitmatgars killed; ...matchlock firing; ...had to withdraw and make a circuit of two coss. ...

Captain Reynolds has written to the zemindar of the village complaining of the violence of his people, and desiring restoration of the articles which fell into their hands.

May 11th. The Zemindar of Ammeree [4] returned almost submissive answers to Captain Reynolds's demand, expressing his regret that the hastiness of our people had produced consequences so melancholy; he alledged he had suffered seriously by the loss of two of his people who were killed, and that two more were wounded, and it was impossible for his single voice to restrain the resentiment of the whole village.

He sent the body of Reynolds's servant, and said he would keep the Bodies of his own men who were killed as a proof, and restore the property as soon as sent for.

The diarist notes that, on arrival at Burhānpur,

The person in authority here who farmed the town from Scindia is not too well disposed towards Europeans, and therefore I did not chuse to risk going into the city [5].

Burrow records an interesting incident at Cheduba [43,160].

As I was taking equal latitudes a number of people came and disturbed me by beating the ground and shaking the quicksilver; and soon after one of the Chief Officers came, apparently displeased, and inquisitive what I was about; I told him first to drive the people away and when I had done I would tell him; after concluding my observations I explained to him that I was correcting my watch; but he did not seem satisfied at all with my explanation; and I afterwards found that the Captain had told them inadvertently that I was a Conjurer, & and could tell fortunes &c, and this they believed: I heard soon after that the Rajah was very angry and supposed I was making observations to determine the Event of some expedition that the English might intend against them in favour of the Mugs [6]. ...

It is interesting to have Beatson's evidence as to the friendliness of people in the south [109];

The duties of Surveying in which I was occupied for some years afforded many opportunities of judging of the disposition of the Natives on the Coast, and I declare altho' I have traversed the wildest parts, amongst Woods and Mountains, from the Circars to Cape Comorin, with a guard of only six sepoys, I never met with the smallest molestation, except among the Colleries; on the contrary I was treated with respect and attention wherever I went [7].

Johnson records the following note whilst surveying the frontiers of Malabar [131].

The Revenues of this country...have not been collected or paid to anybody since the beginning of last war; before that period, the Revenues...were collected by a Rajah named Ram Gooty (who is now in the Cochin Territories for his health). The Rajah expended the Revenues he collected on a God. (Set up near Numbhully cote [131 n. 7] whom they call Hurrowbally) without accounting in the least to any superior [8].

The surveyors did not find the people of Malabar particularly helpful [131];

The want of proper guides has lately much increased the labour and difficulties of the Surveyors; on one hand it renders the necessary local information precarious, whilst on the other, it evidently retards the progress of the Survey; and as no exertion of the Surveyors has been able to overcome the litigiousness of the Tassildars, for whom I had procured orders furnish the necessary guides, I have therefore to request as the only efficacious means, you

[1] Bo S & Pol. 30–9–89. [2] Bo S & Pol. 7–10–89. GG. to Malet, 26-8-89. [3] Conflux with Jumna, 54 J/13. [4] 54 J/14. [5] BM Addl MSS. 13582 (83). [6] IO Maps. MS. 5. [7] Paper by Beatson, Oct. 1801; HMS. 87 (205–270). [8] Bo Sur. Vol. 18, 17–4–93.

will be pleased to direct the Northern and Southern Superintendents to furnish each Surveyor with a Good Peon of their own, to remain with them during the survey, having an order from their respective Masters or the Tassildars to furnish these gentlemen with one or two guides from each district, as they proceed [1].

Blunt had several anxious moments during his journey from Chunār to Rājahmundry [60–2],
and received considerable opposition from the natives, while the symptoms of enmity were at one time sufficiently alarming to deter him from proceeding to Amarakant [60 n. 12] although he was only 40 miles distant from that place, and considering it as he did 'one of the greatest natural curiosities of Hindoostan' he relinquished the idea of visiting it with a feeling of much disappointment [2].

He was obliged to deviate from the track which had been proposed, as he found it impossible to penetrate through the wild and inhospitable regions bordering on the Northern Circars, and in attempting it, had nearly fallen a sacrifice to the ferocity of the wild Goonds, by whom he was attacked. ...

Travelling through a part of the Nizam's Dominions his perwanahs were of no further avail, as he had not foreseen that he should require any others than such as were obtained frem the Nagpoor Rajah and Mahratta Chiefs. He found the people of course extremely suspicious, and shewing every inclination to molest him on his progress. When arrived near Paloonshah [3], he was suddenly surrounded by a considerable armed force, and to avoid hostilities he allowed himself and party to be conducted to the Rajah of the place, with whom he was necessitated to enter into a negotiation, when, after an interview in which Lieutenant Blunt found it expedient to present the Rajah with a Toorky horse, he was allowed to depart in peace, but not until he had distributed likewise among the Rajah's servants a few inconsiderable presents. From here he met with no further molestation, and arrived safely with his papers in the Hon'ble Company's territory, after performing one of the most hazardous and laborious journeys that had ever been made in India [4].

Other surveyors also had found the people of the Nizām's Dominions particularly suspicious. When Emmit ran a line through the southern districts in 1791, the Resident wrote to his commanding officer, Little,

The conduct of Captain Reynolds was deserving of imitation in the caution he observed lest the natives should see his instruments. ... There was more cause for circumspection in the Nizam's Dominions than in those of the Mahrattas [5].

Mackenzie says that when he was working round Hyderābād,

One of the earliest instructions given to me on that survey was to avoid going into their walled places except by permission, or to erect or exhibit the instruments as seldom as possible; strict adherence to these measures only enabled me to do so much, and I never felt myself at liberty to measure a base in the common cursory way, but in obscure places, and near our detachment [6].

Emmitt's appointment at Poona at the end of 1794 [130], had to be arranged with circumspection, Malet writting that he had
been employed...as Surveyor with me, since December last; though for reasons that need not be explained, under Furlough of absence, in preference to a Public appointment to an office that thereby might have attracted notice and interruption here [7].

During his survey with Blunt through Central India at the end of 1792 [43], Anburey met with occasional unfriendly villagers;

15th December, Selleyah [8]. The people at this place chiefly Patans, and showed every inclination to quarrel had the least encouragement been given them to do so. Refused supplying coolies and every other necessary. ...

17th. The people at Salemow [9] again troublesome, pushing into the camp notwithstanding the Sepoys begging them to keep off, and shewing every inclination for hostilities: the people of Phaadu on the contrary shewed every friendly attention by letting the people bring grass, milk, and everything we wanted; *Coolies* and *Guides* [10].

Surveyors often met with the greatest friendliness and courtesy, of which Mackenzie gives an instance;

In 1794, some years ago, I passed through the Canoul [11] Nabob's country by Attoor...to Hyderabad [112]. I was taken very ill of a fever at Alpoor with most of my followers, just

[1] From Sartoriūs, BoMC. 20–1–95. [2] Journal of Waugh & Renny, 1833. MRIO. M263. [3] Paloncha, 65 C/10. [4] SG's. report, BMC. 29–2–96 (49). [5] Hyderābād Cor; HMS. 613 (80), 27–10–91. [6] DDn. 41, 6–12–99. [7] Bo MC. 8–12–95. [8] Salaiyah, 55 I/7. [9] Siemao, 55 I/11. [10] Fdbk. GBO Lib. Aa. 41. [11] Kurnool, 57 I/1.

as I was on the point of going to Canoul to visit the Nabob, who in the handsomest manner sent a good dhooly and a set of his own bearers, who carried me safe to Hyderabad: I can never forget this civility, and if you see him I will thank you to mention that I retain a very just sense of his kindness.

I also wish you would let me know what small present would be most acceptable to him, and I would send it up to your own care, I believe glasses, cordials, and china, are sometimes acceptable to Moor men [1] of rank; after you go to Canoul enquire discreetly, but let it not be mentioned to the Nabob; I do not pretend to go a great length, but I should like to show my remembrance of his civility [2].

Hoare tells us that when on the survey of the Jumna River [57],

At Hermeerpoore [3] the principal pundit requested I would not so much as disgrace him as to pass his place: I accordingly brought to, as I wished to gain some information, and he paid me a visit. I found him a very good man, but as usual the number of servants prevented our being so properly supplied as he wished [4].

MILITARY ESCORTS

When Rennell left Calcutta on his first survey in May 1764 he took with him only 11 sepoys, and Richards in December 1765 brought another ten and a *Jamadar* [5]. It was therefore with this small body of 21 men that Rennell hastened to Morrison's assistance against the *sanyāsis* [292] [6]. After this affair the Governor ordered that the Surveyor General should always travel with an escort of a full company, with one or more British officers [7].

Most of the surveyors also were allowed a company of sepoys when working in the frontier districts [34]; in earlier years these were detailed from the "pargana battalions" [267], an extra duty that was hardly welcomed, as witnessed by the Resident at Midnapore in 1770 [225];

Mr. Carter arrived here yesterday, and proposes to set out for Ballasore in three or four days. I beg your orders, therefore, as soon as possible, whether [it be] absolutely necessary that he should be furnished with a company of Seapoys from hence.

If this can be dispensed with, without much inconvenience, I should be glad, as almost our whole force is at present required for the service of our Junguls [8].

Carter got his company, but the Resident had to complain three month's later,

Both the Zemindar and Tahsildar at Gatseela [9] have wrote me very heavy complaints against the Seapoys and people of Lieutenant Carter's Detachment, of their plundering every place they go through. I have wrote to Lieutenant Carter on the subject, and must request you will likewise represent the matter to him, and how hard it is for those poor Ryots to loose [sic.] by means of English Seapoys what they have saved from the devastation of the Chuars [10].

Carter's work took him further west, into Jungleterry [11] [34 n. 9], and the Supravisor at "Beerbhoom" writes,

Captain Carter who is employed on a Survey in these Western Provinces, has applied to me for a reinforcement of one or two Companies of Sepoys, as a large body of Chouars, in the Borders of the Herboe district, have opposed his passing thro' that Country on his way to Boglepore [12] &c. ... It was in my power comply with Captain Carter's Application, as I have not a complete Company fit for Duty at this place, independent of those who are detach'd in small Commands for the protection of the province. ...

If you think proper that Captain Carter should be reinforc'd from this Quarter, I doubt not but you'll supply me as soon as you convenientiy can with two Companies of Sepoys. ... In short, Gentlemen, I must take the liberty to repeat to you, the necessity there is of my being supplied with another Company if they can possibly be spar'd from the City [13].

The President thereupon informed the Council,

that...he had ordered a Company from the Burdwan Battalion to join Captain Carter, and that he has reason to believe this supply has enabled him to continue his survey of the Herboe District [14] [294].

[1] The word *Moor* was at that time applied to all Muhammadans. [2] DDn. 83, 27–1–1810. [3] Hamīrpur, 63 C/1. [4] Journal GBO Lib. M 481. [5] La Touche (9, 59). [6] *Hobson Jobson* (872). [7] BPC, 28–10–76 (14). [8] *Midnapore Dist R.* II No. 517, 29–1–70. [9] Ghātsila, 73 J/6. [10] ib. IV No. 3, 23–4–70. [11] 72 L, P. [12] Bhāgalpur, 72 K/16. [13] Firminger, III, 5–1–71. [14] ib. 30–4–71 (21).

As Bengal became more settled, such large escorts were no longer required. When the Surveyor General went up country to survey the Cossimbāzār and Ganges rivers in 1795, and again in 1796 [64–5], he was satisfied with escorts of about a dozen sepoys [1].

Reynolds always took a fairly large escort with him on his journeys through Marātha country. In 1788 he wrote to Malet from Nāgpur [137–8];

Since my arrival at Nagpoor I have despatched people to explore the Road from hence to Masulliputtum [2] by way of Rajmundry, in order to be ascertained of the truth of the common report of the Country, which represented it as much infested by Banditti. The men I employed are returned some days with the fullest confirmation of it.

I have therefore, as the season is now approaching for commencing this journey, made an application to Mr. Forster, the Resident here, to reinforce my guard, so as to make it adequate to my protection.

Forster replied to this application,

I would willingly furnish you with a party of Country Sepoys, ... but as the payment of it must be ultimately made by the Bombay Government, with which I have no official connection, I am apprehensive of the irregularity of taking such a step. Fearing however that the service you are employed in may be wholly frustrated...without some adequate protection to your person and papers against the Banditti, ...I am inclined to recommend to you hiring an escort of the sepoys of this Quarter, and to charge the expence of it to your Government.

Taking this advice Reynolds entertained

twenty of the common foot of this Country, with a Jamidar, as with a less party neither my Person or papers would be safe in going through the immense Jungles that occupy the greater part of the Road. ... The common men are to have seven rupees per month each man, and the Jemadar twelve[3].

In 1793 Reynolds obtained a substantial escort from the Bengal Government for his survey of the upper *doāb* [55];

A detachment consisting of 2 Subadars, 2 Jamadars, 6 Havaldars, 6 Naiques, 1 Drummer and 1 Fifer, and 100 Sepoys is to be immediately formed at Cawnpore for the purpose of attending Captain Reynolds...on public business, and from whom the Officer appointed to the Command of the Escort will receive his orders.

The following Establishment and allowances are fixed for the Detachment:

1 Sircar ...	1 Native Doctor ...	1 Fireman
2 Doolies ...	2 Puckaullies ...	1 Carpenter
1 Mistry Smith ...	2 Lascars ...	2 Coolies
		1 Bildar

Allowance for the writer and Stationery ... ... Rs. 20

For Iron, Steel, Charcoal and materials for repairing accoutrements ... ... Rs. 20

An Annual Allowance of Rs. 70 for supplying Wax Cloth, Tarpaulins etc.

The Detachment is to be furnished with Ten rounds of Ball Ammunition & I Flint per man in their pouches, and a further quantity of three bullock loads, and 4 flints per man, is to be sent with the Detachment, for the carriage of which the Commanding Officer will provide cattle, and charge for the expence in a contingent Bill, certified upon honor[4].

He says in another place that,

I had, besides, a Jemadar's detachment belonging to this Presidency, of between thirty and forty men; and to the Bengal detachment two European Officers on double full Batta, Tent, and all field allowances, were attached, besides an Assistant Surveyor (an Engineer Officer) on the same footing[5].

As this establishment was over and above all that taken for survey purposes, Reynolds and Blunt must have led a fine caravan.

William Francklin, an officer of the escort, describes their presentation to the Emperor of Delhi;

On the 11th of March 1794, the author accompanied Major Reynolds, who was at Delhi on a deputation from the Bengal government, to an audience of his majesty, Shah-Aulum [24 n.6]. ... [We] presented our Nazzars [6] on white handkerchiefs, each of our names being announced at the time we offered them. The King received the whole, and gave the Naz-

[1] DDn. 16 (82), 8–4–95. [2] Masulipatam, 65 H/4. [3] BoMC. 11–10–88. [4] Bo GO. 14–10–93: BoMC. 23–6–96. [5] BMC. 12–2–96. [6] Being a definite number of gold mohurs according to rank.

zars to his son...and two other princes who sat on his left hand. ... We then retired with our faces towards the presence, made the same obeisance as before, and returned a second time to the Musnud[1]. After a slight conversation, we were directed to go without the enclosure, and put on the Khilluts which his majesty had ordered for us. They consisted of light Indian dresses, a turband Jamah, and Cumberbund[2] made of cotton, with small gold sprigs.

On being clothed in these dresses, we once more returned, and after a few minutes stay, previous to which Major Reynolds received[3] a sword and a title from the king, we were dismissed.

Francklin also describes as a notable sight a body of Sikh troops in the service of Sindhia, which they met whilst out on survey.

Early in 1796 Reynolds proposed another expedition to the western frontiers of Bengal, and applied to the Bombay Government for an escort of the same strength as he had from Bengal, saying,

I am well aware, from the small military force under this Presidency, the great demand for their services, and the weak state of some of the Battalions, may render the compliance inconvenient.

He suggested that it might be formed as a special unit because,

The inconvenience in taking from the establishment...is the hardship to the Battalion they may be ordered from, and the disgust it creates in the breast of the Officer Commanding it, in having so large a portion constantly detached and from under his authority. ...

There is one other consideration, ...the being able...to disband them on my reaching the Bengal Provinces, and putting an end to the expence, when of course I may be furnished, as I was before, with an Escort. ...

I shall be able to procure the number of men necessary from the Nawab and Buckshee[4], and from among the Troops which they have lately disbanded at Surat, which, altho' not so well disciplined as our Troops, are nevertheless old soldiers, and will answer every necessary purpose.

With respect to the allowances (Pay and Batta) for the escort, I do not conceive that the Sepoys lately disbanded at Surat by the Nawab would willingly engage with an English officer for foreign service, and in so active a line as mine must necessarily be, when I set out, without the common advantages enjoyed by similar ranks in the Company's service. ... For my own sake, I should not like to entertain any but able-bodied men, and such I could depend on emergency to place some reliance on, for altho' it cannot be supposed that I am meant to force my way through the country, but on the contrary to effect it by friendship and permission, still it has happened in the course of my journies, that I have been obliged to make use of the Military force with me, for the preservation of myself, and partly against large parties of Banditti, which are too often the terrror of some the interior parts of India[5].

He estimated the monthly cost at Rs. 1189-3-10 a month, and Government sanctioned his raising such an escort provided he

discharge the Native Officers and men on his arrival at the first station in the Bengal Provinces; taking from them their Arms, and lodging them there[6],

It is not surprising that the Bengal Government ruled that the charge of this escort should fall on the Bombay Government. The letter Government were however fully generous, aud authorized an establishment of artificers, and transport for ammunition and accommodation for the sick, and allowed Reynolds to purchase

24 yards ... Aurora Cloth — 20 yards Superfine Dark Green Cloth
80 „ Blue Coarse „ — 10 „ „ „ Blue „

which probably sufficed for his personal bodyguard[7].

He never made the expedition for which this escort was primarily sanctioned, but brought on to its strength all his native surveyors, their assistants, and such escorts as accompanied them on survey [287];

He had been in the habit of employing the people of his escort, either as principals or Assistants in the detailed surveys, and had in all such instances allowed them both their pay and Batta, besides other allowances and rewards, to them and to others, altogether considerably exceeding whatever he drew on every account from Government[8].

[1] Throne. [2] Waistbelt. [3] Francklin (204). [4] Paymaster or accountant; *Hobson Jobson*, Buxee. [5] BMC. 9-2-96. [6] *ib.* [7] BMC. 23-9-96. [8] DDn. 146 (46), Min. by Governor, 16-4-1801.

POSTS AND COMMUNICATIONS

During the 18th century the sailing ships of the East India Company used to take, on an average during the favourable season, from five to seven months from London to Madras, sailing from London between October and April only; the passage might last very much longer.

In 1789, a Dutch East Indiaman arrived at Calcutta which had left Amsterdam 14 months before. In 1809 the Calcutta Gazette writes "seven and a half months have now elapsed since the date of the latest advices from Europe"[1].

On the other hand in 1776 Rennell writes home

The Triton which left Gravesend the 10th April arrived here in the beginning of September. We had advices long ago from England as late as the end of May, by way of Suez. This is a new route opened by Governor Hastings; and letters which left Marseilles the 3rd June, arrived here the 20th August. This...is a ready communication with Europe, and may be kept open at all times, if we chuse to take a little pains[2].

Philip Francis writes of this same event with, however, no acknowledgement to Hastings, August 21st, 1776,

A ship is arrived here from Suez with Letters from England so low as the 20th of May. ... Such a passage is almost miraculous[3].

We also hear of

Mr. Whitehill's route hy Suez to Madras, when in charge of the Company's orders to restore Lord Pigot[4] [256 n.6]; which journey he accomplished in 59 days from London to Fort St. George[5].

The passage between Calcutta and Madras occupied anything from 6 days to 28 days, according to the weather and the season [101][6], so provision for regular postal arrangements by land were organised as early as 1764, when the Directors were informed that

we have for some time established a constant correspondence with Madras by Land, by the means of Stage Cossids[7].

Communication between Bombay and the Malabar Coast seems to have been even more uncertain; Cameron [qv], in 1758 found it impossible to get any boat to take him from Tellicherry to Bombay at the end of May, and says that a passage would not be possible for six months.

For the journey to the far East,

the passage to the Straits was taken outside the Andamans and Nicobars; and it was not till about 1795 that the safety of the direct passage along the coast of Lower Burma had been demonstrated, and ships could hope to reach Calcutta from the Straits in about 15 days[8].

We find many references to the demand for timber for ship-building [20 n. 9, 103], and to the dockyards at Bombay and Kidderpore, and Rennell notes,

Teak ships of 40 years old and upwards, are no uncommon objects in the Indian seas; while an Europe an built ship is ruined there in five years. The ships builts at Bombay are best[9].

He records in 1788 that

a regular post is established throughout the parts of Hindoostan subject to the East India Company, and also from Calcutta to Madras. The postmen always travel on foot. Their stages are commonly from 7 to 8 miles; and their rate of travelling within our own districts about 70 miles in the 24 hours[10].

Regular lines of postal communication by runners were gradually established between the more important cities, these being termed *dāk* in Upper India, and *tappal* in Madras: individual travellers kept in touch with these established lines by means of their own *harkaras* or *cossids*.

Where regular lines of post-runners were established, letters travelled with great speed from place to place; for example, a letter from the Resident at Poona, dated 4th was read at the council in Bombay Castle on October 7th, a speed that would not disgrace the post office of 1940. On the other hand, a letter written by

[1] *Calcutta O & N.* (177). [2] HMS. 765. 16–10–76. [3] Francis, I (268). [4] Bio. Notes: *sv.* Darlymple. [5] Taylor, I (454–5). [6] Hickey & Colebrooke [qv] embarked in the Hooghly on Christmas Eve; and reached Madras Jan. 11th (1791). [7] B to CD. 26–11–64 (60). [8] Aspinall (189). [9] *Memoir*, 1793 (260–1). [10] *Memoir*, 1788 (237).

the Governor General at Fort William on August 26th, did not reach Poona till October 1st[1].

In discussing the probable width of the Peninsula [178–9], Herbert writes,

I was 25 days on my journey from Tellicherry to Fort St. David's in the year 1747, and lost as little of this time as possible, being spurr'd on by anxiety lest the ship I belonged to should sail before my arrival [211 n.3]: And I find, by my memorandums, that I was at least 220 hours travelling it, deducting all delays for eating, sleeping, &c., in that time; But I have been informed that the...Couriers have done it in 9 or 10 days; that is to say, they forward letters &c. in that time; for they do not go all the way, but being generally Bramins, they stage it from one pagoda to another; so that upon extraordinary occasions they lose neither eating nor sleeping time. ... While I was on the spot I computed my travelling at the rate of a league an hour, ... I can in no ways allow it at less than $2\frac{1}{2}$ miles[2].

The normal means of travelling from place to place for Europeans was by palanquin, with fresh bearers at regular stages; always travelling by night during the hot weather.

The more leisurely and comfortable way, especially with a quantity of baggage, was to travel by river, of which Mrs. Kindersley writes,

The progress up the Ganges is so exceedingly slow, that the voyage from Calcutta to Allahabad takes near three months to perform it in[3]; at the same time that it is common to go from Allahabad to Calcutta in twenty days[4].

The Presidency Postmaster General had various agents distributed through the country. In 1774 Alleyne was transferred from Cuttack to Ganjam on such duty[5], and Motte was employed for several years at Benares "as agent for despatching the Cossids & expresses from the Presidency to Bombay[6]". Accidents were rare, but the *Calcutta Gazette* records in 1792 that,

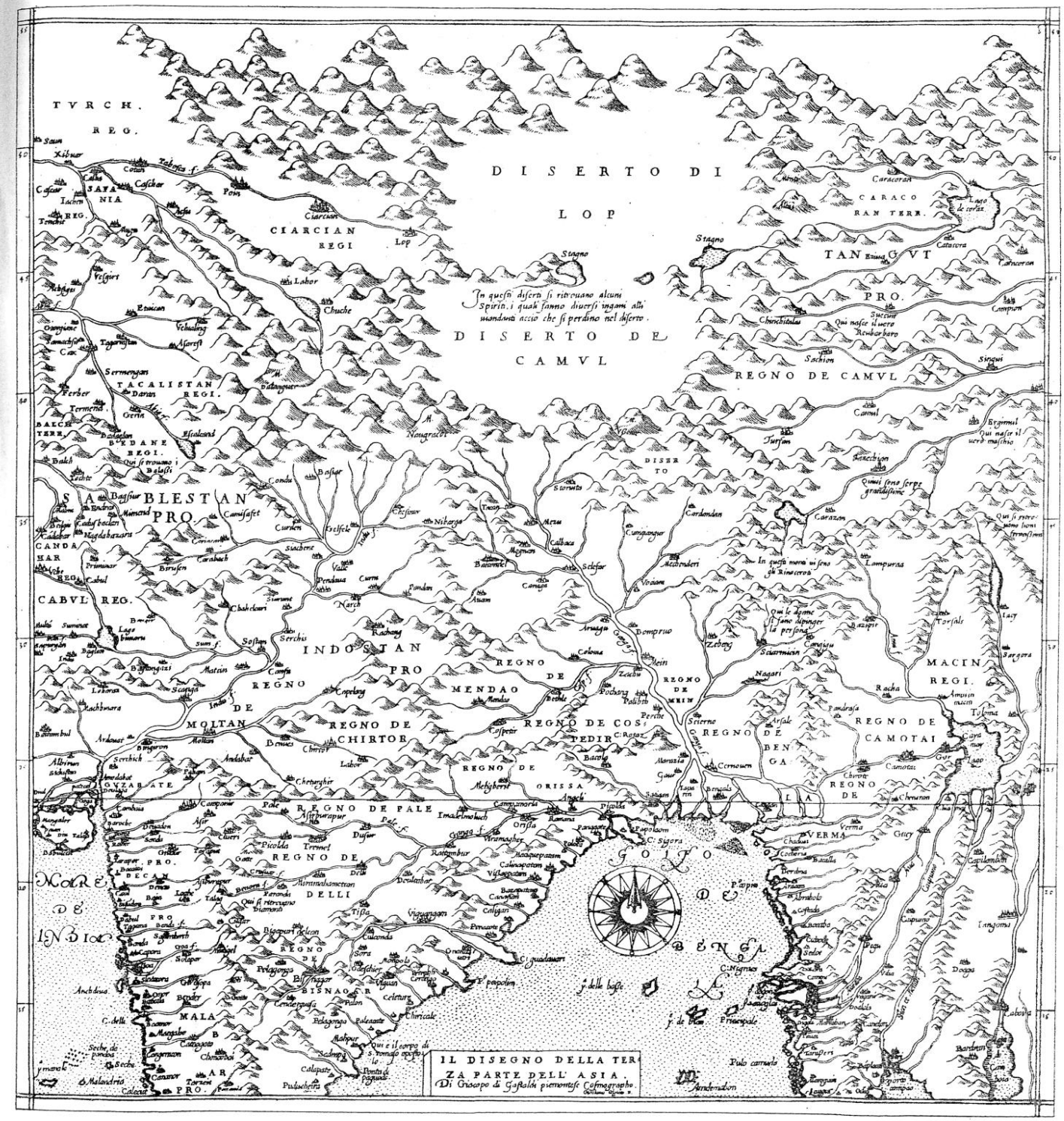
Mail of 2nd inst. was robbed between Jagganaut[7] and Neringapatam, the Hircarras and Guides murdered, and the Bombay Letters entirely lost; the Madras Mail has been since recovered complete[8].

[1] *v.* Bo S & Pol. 7–10–89. [2] Herbert (51n). [3] cf. Colebrooke [qv]. [4] Kindersley (93–4).
[5] BPC. 26–5–74. [6] BSC. 19–12–74. [7] Puri, 74 E/13. [8] *CG.* 19–7–92.

TERZA PARTE dell' ASIA

by Giacopo di Gastaldi, 1561

Plate 16



Reg. No. 98 M.D. 1939-600.

Reduced, by a half, from a map published in Venice, entitled *Il Designo Della Terza Parte dell' ASIA*, by permission of the Trustees of the British Museum.

Published at S.I.O. Dehra Dun

Note the complete absence of longitude values, and the ignorance of the positions of places like Multan, Chitor, Lahore and Delhi.

Geography of Central Asia largely taken from Marco Polo [70].

CONTINUED FROM P. vi.

ADDENDA & CORRIGENDA

Page 309 col. 1, Anburey, line 17, *after* 116 *insert* 299.
„ „ 2, line 10 from bottom, *for* 208 *read* 238.
„ 310 „ 2, Baillie, line 8, *delete* Portrait.
„ 314 „ 1, Bogle, line 2, *for* 1746–7 *read* 26–11–46.
„ 317 „ 1, last line, *for* aumenting *read* augmenting.
„ 321 „ 1, Byres, line 10 from bottom, *for* Cavery *read* Cauvery; Cadogan, line 2, *for* 1–1–54 *read* 1–12–54.
„ 2, Caldwell, James, line 4, *for* Rickarts *read* Ricketts *and insert new footnote* John Henry Ricketts (Rickarts) (1767–92), Ben. Engrs., Ens. 3–1–85; elder bro. of Vice Adm. Sir R. T. Ricketts, 1st Bart.; father of John Ricketts, founder of Doveton Coll., Calcutta, d., in Carnatic, 11–4–92.
„ 322 col. 1, line 17 from bottom, *insert as new para* 1761, assisted in obsn. of transit of Venus [153].
footnote 2, *for* consin *read* cousin.
„ 324 „ 1, Camac, line 9 from bottom, *for* 000, 000 *read* 294.
„ 326 „ 1, line 9 from bottom, *after* Corah *insert* [pl. 1].
„ 2, line 21 from bottom, *for* Bristowe *read* Bristow.
„ 329 „ 2, line 12 from bottom, *after* 271 *insert* 335.
„ 331 „ 2, line 4, *after* world *insert* [84].
„ 332 „ 2, line 6 from bottom, *after* Corah *insert* [326].
„ 333 „ 2, line 18 from bottom, *for* not *read* on.
line 4 from bottom, *after* (qv) *for stop read comma.*
„ 334 „ 2, line 8, *commence para* 1772–5, comdg. batt. at Berhampore; 1775, after tr. to Midnapore, Dismd., *etc.*
„ 336 „ 1, Erbb, line 2, *for* sergant *read* sergeant.
„ 338 „ 2, Guthrie, line 8, *for* Daniel *read* Daniell.
Hardwicke, *add final para* April 1817 to Feb. 1818, comdg. Art., Dum Dum, kept meteorological journal, MRIO. M 534.
„ 340 „ 1, Humphrays, line 7, *after* Inf. *add* (1750/1–1803).
line 5 from bottom, *after* instruments *delete comma.*
„ 342 „ 1, Jones, line 6 from bottom, *after DIB.* insert *Ency. Brit.*
„ 348 „ 1, line 17 from bottom, *for* Chhattarpur *read* Chhatarpur.
„ 349 „ 1, Mackenzie, line 18, *for* Fulchner *read* Fulcher.
„ 351 „ 1, line 11 from bottom and footnote 6, *for* Blackiston *read* Blakiston.

Page 352 col. 2, Marsack, line 13, *for* 000 *read* 360.
„ 358 „ 1, Montresor, lines 6, 7, *for* Ens. 5–4–32 ... *read* Pr. Engr. 2–10–31; Ens. 14th Foot, 5–4–32 ... Maj. Engrs. 14–5–57. ...
„ 360 „ 1, last line, *for* the 3rd Mysore War *read* 1790–2; *for* Maj. General *read* Lieut. General.
„ 2, Nuthall, line 2 from bottom, *for* Arcott *read* Arcot.
„ 361 „ 1, Orme, line 12 from bottom, *after* 223 *insert* , pl. 3 n.;
„ 1, Orme, line 3 from bottom, *after* 331 *insert* , 348.
„ 2, line 5, *for* acquinted *read* acquainted.
Parrott, after line 4, *insert new para*; Sailed from England 23–11–67, as 4th mate of *Adm. Watson*, Indiaman.
„ 364 „ 2, line 5, *after* Arcot Rupees *insert* [279 n.1].
Polier, line 13, *delete* killed, Calcutta, 1758–9, *and substitute* d., Calcutta, 1759, of wounds received at siege of Madras, 1758.
„ 366 „ 2, lines 4, 5, *for* picture Col. Mordaunt's Cock Fight *substitute* pictures *Col. Mordaunt's Cock Match* and *Claude Martin and his Friends.*
„ 376 „ 2, line 20, *for* 3–3–24 *read* 3–3–1824.
„ 380 „ 1, line 26 from bottom, *for* heath *read* health.
„ 381 „ 2, line 2 from bottom, *for* Aracan *read* Arakan.
„ 384 *at end of note 12 add* In letter dated 25–8–77, Eliza Draper writes "Sir I. Newton used to say that some Blockheads [*sic*] or other would find out the Longitude bye and bye—and by the way, it is found out at Poonah by an English Chaplain in the Company's Service, who, through the Directors, claims the reward offered by Parliament". (Wright).
„ 386 col. 1, Charles Stewart, line 5, *for* Vadgaon *read* Wadgaon.
„ 388 „ 1, Terranneau, line 5, *after* Anne—— *insert* ; grandfather of Robert Terranneau (1790–1841), Revenue Surveyor, Bengal.
„ 392 „ 2, line 14 from bottom, *for* 191 *read* 102.
„ 397 „ 2, line 8 from bottom, *after* Noland *insert reference number to new footnote to read,* sometimes Nowlan or Nowland (1740–1–80), 2/Lt. Bom. Est. 12–4–63; Lieut. Ben. Est. 10–2–64; Capt. 8–7–66; Resd. Sept. 1766; restored as Capt. Bom. Est. 17–3–69; bur., Bombay, 1–8–80.

Further Abbreviations

A D C.	Aide-de-Camp
A G.	Adjutant General
A R.	Astronomer Royal
Acctt.	Accountant
Adj.	Adjutant
Adm.	Admiral
Admn.	Administration
Adv.	Advertise/d/ment
App/d/t.	Appoint/ed/ment
Arrd.	Arrived
Art.	Artillery
Asst.	Assistant
Astr.	Astronomical
Attd.	Attached
Auth.	Author
B A.	Bachelor of Arts
b.	Born
bapt.	Baptized
Bart.	Baronet
Batt.	Battalion
Bio.	Biograph/ical/y
Bri.	Brigade
Brig Gen.	Brigadier General
Bro.	Brother
Bt.	Brevet
Bur.	Buried
c.	about
C B.	Companion of the Bath
C P.	Central Provinces
Cant.	Cantonments
Capt.	Captain
Capt Lieut.	Captain Lieutenant
Cav.	Cavalry
Cem.	Cemetry
Cert.	Certificate
Chpn.	Chaplain
Civ.	Civil Service
Co.	County
Cod.	Codicil
Col.	Colonel
Coll.	College
Com.	Committee
Comd/d/g.	Command/ed/ing
Comd/r/t.	Command/er/ant
Commy.	Commissary
Comn/r.	Commission/er
cr.	Created
Ctml.	Court Martial
D D.	Doctor of Divinity
D L.	Deputy Lieutenant
D Q M G.	Deputy Quartermaster General
d.	Died
dau.	Daughter
Depy.	Deputy
Dett.	Detachment
Dismd.	Dissmissed
Div.	Division
Dman.	Draughtsman
dsp.	Died without issue
Eccl.	Ecclesiastical Returns
Ed.	Educated
Edn.	Edition
Engr.	Engineer
Ens.	Ensign
Est.	Establishment
Eur.	European
Expn.	Expedition
F R S.	Fellow of the Royal Society
Fd Engr.	Field Engineer
Ft.	Fort
Furl.	Furlough
Fwkr.	Fireworker
G C M.	General Court Martial
G M.	Gentleman's Magazine (periodical)
G O C.	General Officer Commanding
Gen.	General
H M's.	His Majesty's
H M S.	His Majesty's Ship
Hon.	Honourable
I.	Island
I O.	India Office
I O Logs.	India Office Logbooks
Inf.	Infantry
Kt.	Knight
LLD.	Doctor of Laws
Lat.	Latitude
Lieut.	Lieutenant
Long.	Longitude
Lt.	Light
Lt Col.	Lieutenant-Colonel
m.	Married
M A.	Master of Arts
M D.	Doctor of Medicine
M G O.	Master General of Ordnance
M I.	Monumental Inscription
M P.	Member of Parliament
Mag.	Magazine
Maj.	Major
Maj Gen.	Major-General
Mar.	Marine
Math.	Mathematic/al/s
Med.	Medical Service
Merch.	Merchant
N.	*Nala*, Stream
N I.	Native Infantry
O C.	Officer Commanding
Ob.	Obituary
Obs/d/n.	Observ/ed/ation
P W I.	Prince of Wales's Island, Penang
Pers Rec.	Personal Records, I O.
Pract Engr.	Practitioner Engineer
pr.	Probate ; proved
Presdy.	Presidency
prob.	Probably
Progs.	Proceedings
Pub.	Published
Qmr.	Quartermaster
R A.	Royal Academy/Artillery
R A S.	Royal Astronomical Society
R A S (mn.)	Monthly Notes of R A S.
R A S B.	Royal Asiatic Society of Bengal
R M A.	Royal Military Academy, Woolwich
R N.	Royal Navy
Regt.	Regiment
Resd.	Resigned
Resdt.	Resident
Ret.	Retired
Rev.	Reverend
S J.	Society of Jesus, Jesuit
Sd.	Signed
Subsy.	Subsidiary
Supt.	Superintend/ent/ing
Surg.	Surgeon
Surv/d/r.	Survey/ed/or
Tr.	Transferred
unkn.	unknown
unm.	unmarried
Vol.	Volume
W P.	Writers' Petitions, I O.

BIOGRAPHICAL NOTES

ABINGTON, William. Bom. Inf.
b. 1740. d. 29–3–1816.

2nd Lieut. 23–1–62 ... Maj. 26–12–81.
m., Bombay, 22–1–67, Miss Elizabeth Cawley.

Comdg. 9th Batt. in action at Kalyān, 24–5–80. Comdg. 10th & 11th Batts. to Tellicherry, April 1781; captured Mahè 12–2–82 & Calicut 13–2–82; relieved by Humberstone [125]. Sketch of coast between Calicut & Mahè[1].

ADAMS, John. Ben. Engrs.
d. 1767, in Bengal, unm.

Ens. 6–10–61 ... Capt. 30–12–66.

Mother, Eleanor Adams, of Ashburton, Devonshire; uncle, Richard Adams, of Cornwall.

Will sd. Dacca 17–7–67; pr. 1767 (v. Portsmouth). Hodson.

1762, Asst. Engr., Ft. William.

On survey in 1766; placed under SG.'s orders from 1–1–67 [31]. Survd. Mahānanda and other rivers in Purnea, and roads in Midnapore[2] [32, 52, 225]; Obsd. astr. lat. Malda [153].

ALLAN, Alexander. Mad. Inf.
b. 1764. d. 14–9–1820, unm.

Ens. 27–8–80 ... Furl. 1799; Maj. 23–6–1803.
cr. Bart. of Kingsgate, 18–9–1819.
EIMC. I (454).

Served with 3rd and 13th N I.; Appd. junior Capt. of Guides [97, 109]; Capt. of Guides, 30–8–92 [272, 287]; Resd. 10–2–98 [111]; Town Major, Madras, 1797.

Survd. provinces S. of Coleroon R. from May 1789 [110, 174].

3rd. Mysore War; May 1790 to Jan. 1791, Survd. marches of Medows' army [6, 110–1]; 1791–2, Guide & QMG. with Nizām's Horse; measured 2300 miles of road [7, 110]; zeal and activity commended by Lord Cornwallis[3] [253].

1793, submitted map of these marches and sketch of roads and passes along southern frontier of Mysore [111, 113, 193, 244], which latter however Montgomerie described 33 years later as "very poor"[4].

4th Mysore War 1799, following extracts from his personal journal[5] [9, 118];

"I have had many conversation respecting the route to Seringapatam, & I thought it advisable to discuss the subject very fully with Major Beatson. After referring to my field books of the Marches of the Army under Marquis Cornwallis...we have given our opinion that we should proceed by way of Aunacull. ...

"I have made sketches of the proposed route of the Army from hence to Seringapatam. ... Capt. Orr [qv] has not only had access to all my maps and field books, but has had my personal assistance on the march; and as I every evening prepare sketches of our actual position, and that proposed for the ensuing march, as well for Wellesley as the General [Harris], I have scarce a moment to myself. ...

I am particularly anxious the General should be sensible that I have no recollection of his behaviour respecting the QMGship, and yet, had he behaved as he ought to have done, how enviable would my situation be now".

After the capture of Seringapatam General Baird entrusted to Allan the business of gaining entrance to the Palace, "where it was thought the enemy in defence of their sovereign and his family would make a serious resistance"[6].

"Nature had given to Major Allan a heart, form, and a countenance admirably fitted for this humane duty"[7].

"Taking a white flag", Allan was after a time successful in gaining the surrender of the two princes, and the opening of the palace gate. The palace was searched for Tipu, but his body was eventually found in a gateway on the north face of the fort[8].

May 11th, Allan "this morning went round the fort with Baird and Lambton [9]."

"May 13th. Beatson received a letter of the 23rd of April from Lord Mornington [GG.] informing him that a vessel was ordered to be ready at Bombay to convey his Lordship's despatches to Bussora; ... he wished that one of us should proceed to Bombay, to go home overland. Beatson declined this (owing to the great difficulties of a journey to Bombay at the moment). ... I also determined to go to Madras, and not to make an attempt in which I was so likely to fail. ..."

"May 16th. When I waited on the General the other day, to ask his permission to go to the Presidency, he thought I was going to make some request respecting the appointment of QMG. ...; I thanked him, and...said there was nothing that the Service offered which would induce me to remain in the country, now that I could retire with propriety. The General has repeatedly regretted that he had not made me QMG.; this is so far satisfactory, as it shows that his refusal to recommend me for the appointment was not because he thought me ill-qualified: there was mystery in the whole of his conduct in that business. ...

"I have given the General a map of the marches of the army, which he means to send to the GG. I have addressed an official letter to the A G., ... it being my intention to embark for Europe on the 1st ship that sails".

Allan and Beatson were then sent down to Madras with dispatches, and Allan slipped ahead of his companions;

"May 28th. Arrived at Amboor[9], ... I set off immediately and reached Vellore in the afternoon, to the no small mortification of my fellow travellers. Being informed that Lord Mornington was to leave Madras on the 30th, ... I prevailed upon Mr. S— to furnish me with bearers, and set off from Vellore after supper. ...

"I got to Madras early the next morning (30th). I waited immediately on Lord M—, and was received with every mark of kindness, and in a manner particularly gratifying. Being the first officer from the Army, I had a very long and unreserved conversation with his Lordship".

At a public ceremony on June 4th for the reception of the colours of Seringapatam, Allan "had the priviledge of handing to Lord M— the sword of Tippoo Sultan, and Lord Mornington replied 'The gift is particularly acceptable from an officer distinguished throughout the whole campaign by the most meritorious exertions of activity and valour'".

Allan arrd. in England early 1800; became a Director of EIC. 1814; M P. for Berwick 1814–19.

Pub., June 1794, *Twenty Views in the Mysore Country*[10]; all his fdbks. show an artist's touch.

"Col. Sir Alexander Allan, Bart, bred up in the Company's army, of which he was at once its pride and ornament, his eminent qualities successively attracted the notice of those distinguished Governers General of India, the Marquesses Cornwallis and Wellesley, also of Sir Arther Wellesley, now Duke of Wellington, with all of whom he formed a friendship of the closest nature, and which terminated only in Death. After acquiring a competent fortune, the reward of incessant and distinguished service, ... he retured to England. ...

[1] *Memoir*, 1793 (27). [2] Map, MRIO. 51 (3), shows roads survd. by Adams 1768–9, but pr. of will makes this date impossible. [3] M to CD. 3–2–93 (9). [4] DDn. 246 (88). [5] Sinha. [6] ib. [7] Lushington (245). [8] Sinha: cf. Beatson (cxxvii–xxxi) & Colin Mackenzie (1–9). [9] Āmbūr, 57 L/9. [10] VM. Exbt. 934. cf. Colebrooke (328).

"With manners of the most winning cast, and a heart overlowing with benevolence, he displayed all the accomplishments of the gentleman, and the best affections of the friend. The dignity, yet penetrating kindness of his deportment, will be remembered by all, of whatever rank, who have survived his acquaintance; and the voice of gratitude from hundreds, who are now enjoying the most substantial marks of his benevolence, will preserve his memory long after the hand which dispensed them has mouldered in the grave. ... The title is extinct"[1].

ALLEYNE, Henry. Ben. (Postal Service ?).

Jan. 1769, Agent at Cuttack[2].

"Capt. Alleyne" and Mallock, survd. road from Cuttack to Sumbalpur, with obsns. for lat., probably about 1763–4, being sent by Vansittart [30, 153].

1774, the Madras Council report "the arrival of Mr. Henry Alleyn at Ganjam from Cuttack with instructions from the Post Master General"[3] [304].

AMPHLETT, Thomas. Ben. Civ.
d. Oct. 1763, in Patna massacre (*v.* Knox).

Writer, Ft. St. George, 1755; tr. to Ben. 1761. Sandes. I (125).

5–7–56, Arrd. Madras; 1759, tr. to Bengal as Asst. Engr. to Brohier [93 n. 12]; June 1760, succeeded to charge of Works, but resd. owing to ill-health, Oct. 1762.

28–3–63, Appd. Resdt. at Murshidābād.

Survd. "Hooghly R. from Ghiretti to Nadia", & "cursory survey of Jellinghee R[4]." [222, 269].

ANBUREY, Thomas. Ben. Engrs.
b. 1759–60. d. 31–3–1840, Saugor, C P.

Ens. 12–11–83 ... Maj Gen. 1–1–37.

Son of Obadiah Anburey, of the Accts.'s office at India House.

m. Calcutta, 16–2–94, Miss Dent, dau. of Sir Digby Dent.

C B. 24–10–18; KCB.; Kt.

Hodson.

Employed for 6 years, up to 1783, in Accts.'s office, EIC.; appd. Pract. Engr. for Bengal, 23–9–83.

6–6–87 Appd. Dman. in SGO. Calcutta [236, 271]; Jan. 1791, Acted as O'Halloran's "friend" in presenting challenge to Samuel Showers [qv.], which led to the latter's conviction by ctml.

12–8–91, ordered to "Grand Army", 3rd Mysore War [29, 237]. 1792–3, Survd. route Seringapatam to Hyderābād, and thro' Berār to Kālpi [7, 43, 116, 314].

14–2–94, Appd. 2nd Asst. to SG. [271].

14–2–94 Depy. Commy. of Stores; Commy. of Stores 26–12–96 to 1808. Furl. 1808–10. 1st Comdt. Sappers & Miners, Allahābād, from 1819. Had a distinguished military career; CE. and member of Mil. Bd., 1830; G O C. Saugor Divn. till death aged 80.

Unsuccessful candidate for office of SG., 1829[5].

Pub., 1–1–99, "a set of views entitled '*Hindoostān Scenery*', consisting of 12 select views in India. Drawn on the spot...during the Campaign of the Most Noble the Marquis Cornwallis. ... Engraved by Francis Jukes, Flowland St. London"[6].

These were from paintings made 1792–3, on journey from Seringapatam to Kālpi; adv. *CG.* 24–10–93; the scenes in many cases correspond with delightful little sketches contained in his fdbk. [43]; beautifully reproduced in *aqua tinta*, with soft colours and tones.

ANQUETIL-DUPERRON[7], Abraham-Hyacinthe. French Scholar.
b. 17–12–31. d. 18–1–05.

Son of Pierre Anquetil, grocer, of rue de la Verrerie, Paris; each son added a different suffix to their father's name.

Elected, 1763, member of *l'Académie des inscriptions et belles-lettres.*

La Grande Encyclopedie; Dict. Général; Kanga; Schwab[8] *DIB.*

Enlisted, 7–11–54, as a means of getting a passage to India to fulfil purpose of research into literature of Zoroaster and religion of the Parsis.

Sailing 7–2–55, landed Pondicherry 10–8–55. Left for Chandernagore 1–4–56. Feb. 1757, avoided siege by deserting to Cossimbāzār where Law [qv.] ordered him back; Chandernagore having fallen to the English, he followed Law up country, but did not stay long with him; "les officers de Law...outrés de voir ce civil, qui savait la géographie, consulté par leur commandant sur les meilleures itinéraires, ... firent un scandale. 'Monsieur', dit Anquetil à Law, 'je vois que je suis de trop ici; je quitte le camp, et pars pour Pondichéry'"[9].

He left Law 2–5–57, travelled alone through Murshidābād, Balasore, Puri, "quasi-deserteur", and was well received by Bussy [qv] in the Circārs. From Pulicat he took a small boat to avoid Madras and reached Pondicherry 10–8–57. Not only did he arrive "chargé de notes géographiques, morales, historiques, météorologiques", but also brought the first news of Law's retreat up-country [27, 115, 222].

It is said that "Orme [qv]...reconnaissait en lui le seul voyageur de l'Inde qui n'eut rapporte aucune histoire douteuse; il suit dans tout les cas la fidèlité extraordinaire de sa memoire pour dire chaque chose comme elle est"[10].

Accompanied his brother who was transferred as an official to Surat, where he spent the next three years collecting material for his work on the Parsi religion.

On his way to Surat he visited another brother at Mahè and travelled overland from Goa through Poona and Aurangābād, April 1758, keeping geographical notes which Rennell makes use of [27–8, 127].

During stay at Surat he had an affair with a French lady and killed her husband, and had to take temporary refuge with the English at Bombay. This gave him the opportunity of a journey by land to Bassein[11] in 1760; and at Bombay the Governor "had kindly wished to give me a large map of the interior and of the South Coasts of the Peninsula, made by the Brahmins; I succeeded in making a copy of it"[12] [208 n. 4].

Owing to the war between England and France he could only get return passage to Europe in an English ship, sailing from Bombay April 1761; was treated as a prisoner of war on arrival in England[13], but reached France the following year.

He now lived in Paris till the end of his life occupied in his writings, the chief of which was a translation of the *Zend-Avesta*, the sacred book of the Parsis, pub. 1771.

1776, Tieffenthaler [qv] sent him his collection of maps, on the strength of a brief correspondence in

[1] *EIMC.* I. (454). [2] Maltby (119). [3] BPC. 26–5–74. [4] Orme MSS. xi. [5] BMC. 11–9–1829. [6] BM. K. 115 (20. 1a); cf. Allan [308], Colebrooke (qv). [7] This form of his name was used by him in 1804, but his contemporaries knew him either as *Anquetil* or *du Perron*. [8] Schwab's biography was published with a financial contribution from the "Parsi Punchayet de Bombay". [9] Schwab (34). [10] ib. (37). [11] 47 A/15. [12] Kanga. [13] Visited Bodleian Library.

India [11–2][1]. After acknowledging the receipt in the *Journal des Savants*, 1776, Duperron worked up this material and pub. it in Paris, 1784, under the title "*Des Recherches...sur l'Inde, et la description du cours du Gange et du Gogra, avec une très grande carte* [220] par M. Anquetil du Perron, de l'Academie des inscriptions et Belles Letters; Interprète du Roi pour les Langues Orientales. ... Gravé au frais de l'Auteur". This work forms the substance of Vol. II of Bernoulli's great work pub. in Berlin two years later [72, 151] in which Duperron made an appreciative review of Rennell's *Memoir* of 1783, discussing several points on which he disagreed [80][2]; he corresponded with Robert Orme as late as Sept. 1789[3].

The following is his own account of his frugal life in his old age;

"Du pain avec un peu de lait ou du fromage, et de l'eau de puits, voila ma nourriture journaliére; elle me coute quatre sous, la douziéme partie d'une roupie indienne; je vis sans feu, même en hiver; j'ignore l'usage des draps, et des lits de plumes; mon linge de corps n'est ni changé ni lessivé; je subsiste de mes travaux litteraires, sans revenue, sans traitements, sans place assez bien pourtant pour mon âge et mes travaux passés; ni femme, ni enfants, ni domestique, je suis privé de tous les liens de ce monde; seul, absolument libre, et pourtant trés ami de tous, les hommes, et surtout des gens de probité; dans cet état, faisant une rude guerre à mes sens, si je ne triomphe pas absolument des attraits et tentations du monde, je les meprise; aspirant d'une ame allègre et par des efforts continuels ver l'Être suprême et parfait, peu éloigné du but, j'attends avec tranquillité la dissolution de mons corps[4].

He remained a sturdy royalist till his death, and in the following letter refused to take the oath which was demanded from all members of the newly re-formed Academy;

"Paris. 28–5–04. Monseigneur. Je suis homme de lettres. ... Le vieux Duperron refuse le serment. *Declaration.* Je ne jure ni ne jurerai fidèlité à l'Empereur comme on n'a pas droit de l'exiger d'un Francais, simple particulier, sans places ni fonctions. ... [sd.] Anquetil-Duperron, voyageur aux Grandes Indes, ancien Pensionnaire et Directeur de la cidevant Académie des Belles Lettres"[5].

APRÈS DE MANNEVILLETTE, Jean-Baptiste Nicholas Denis. French Navigator. b. 11–2–07. d. 1–3–80.

Son of Jean-Baptiste Claude D'Après, lord of manor of Blangy, capt. of ship, French EIC.
m., 1732, Mlle. de Binard.
Knight of the order of the King.
As. AR. I. 1800, *Characters* (46-50); *Dict. Générale.*
Born at Havre de Grace; with his father to Pondicherry, 1719; returned to Paris 1721 where he studied Astronomy and Geometry. 1726, sailed as 4th officer on ship bound for Senegal, and, probably on this voyage, made survey of W. Coast of India [123, 151], was shipwrecked, and returned to France.
1830, Appd. 2nd in command of brig sailing for Africa; returned to France 1732, and married; then a voyage to Madeira, and another to Pondicherry [1].

In all his voyages Après pursued his purpose of correcting the charts of the Indian Ocean and of the coasts of Africa and Asia, and in November 1745 he published the *Neptune Orientale*, an atlas of marine geography, from which both D'Anville and Rennell borrowed freely[6] [14, 86, 169].

1750–1, made another voyage to India, with instructions to determine the positions of all important places; on this ship he carried to the Cape the Abbé de la Caille[7], sent by the French Government to measure a degree of meridian.

According to Dalrymple, "No maritime geographer of any age or country can be compared to him. His equal has never existed".

BAFFIN, William. Mariner. b. 1584. d. 23–1–1622, Persian Gulf.

DNB.; *Ency. Brit.*; William Foster; Markham's *Voyages of William Baffin*, 1612–1622, London 1880.
Employed on search for NW. Passage and other Polar exploration, taking tidal & astr. obsns.; hence Baffin Land, Baffin Bay, etc.

Served EIC. 1617–9; survd. Red Sea & Persian Gulf. Visited Surat & sailed home in *Anne* with Sir Thomas Roe, constructing map of the *Empire of the Great Mogol* from Roe's information [209].

Returned east 1620; d. of wounds received in attack on Kishm in Persian Gulf.

His obsns. of Long. at sea by lunar obsn. probably the first on record.

BAILLIE, William. Ben. Engrs. b. 1753. d. 6–6–99, Calcutta, M I. S. Park St. Cem.

Ens. (Inf) 22–12–77; (Engrs.) 9–3–78; Lieut. 7–5–81; Resd. 1788.
m. Chinsurah 22–3–89, Miss Anne Mary Roddy, who d. 27–4–1840, aged 67; left 3 children.
Hodson. Portrait, *Ben. P & P.* V. (232).

1779, Survd. W. bank of Hooghly R. below Rūp nārāyan R. [50]; 1782, survd. neighbourhood of Colgong, and lowlands between Rājmahāl Hills and Ganges [37].

BGO. 25–4–85. Allowed to "retire on furlo' for three years without pay". Jan. 1786, started the *Calcutta Chronicle* as weekly paper, with Upjohn as printer.

1791, obtained permission to pub. engraved map of Calcutta from Wood's survey of 1783–5; adv. *CG.* 26–7–92; "Plans nearly ready for publication, 53 inches long, and on a scale of nearly 7 inches to a mile. Rs. 25 on rollers; Rs. 20 on cloth". Govt. subscribed for 150 copies but Wood was disgusted with the map, which did no justice to the original survey, and Govt. refused to complete payment for the copies received [53].

Baillie then became Sec. to the Free School Society, whose school had been founded in 1790, and held this post till his death.

Ben P&P. V (232); "In 1794 appeared a set of 12 views of Calcutta, drawn by Wm. Baillie, ... Etchings on copper, afterwards coloured by hand. They are well drawn, and give a very good idea of the Cacutta of the period. Two views are reproduced in *Bengal Past & Present.* In his advertisement Baillie describes himself as Superintendent of the Free School. He also published 8 views of the Ruins of Gour and Rajmahal, giving his address as 13 Chitpore Road".
1796, adv. a further set of 12 views, but was never a successful business man.

[1] Maclagan (138). [2] Bernoulli, ii (464–92). [3] Schwab (130). [4] ib (129). [5] ib. (122). [6] Also pub. *Routier des Côtes des Indes Orientales.* [7] b., Rumigny, 1713; d., Paris, 1762; to Cape of Good Hope, 1750. *Phil. Trans.* abbr. XI (472).

BARKER, John. Mad. Civ.
d. 24–7–51, Madras.

Engr. Gen. to EIC. 8–12–49.

One of six assts. to accompany Benjamin Robins[1] [322] to India in 1750.

Survd. line from Devicottai to Trichinopoly [86].

BARKER, Robert. Mad. Art. & Ben. Inf.
b. *c.* 1730. d. 14–9–89.

2nd Lieut. Mad. Train of Art. 1–11–53 ... Capt Ben. Inf. 3–1–57 ... Brig. Gen. 24–3–70.

Only son of Robert Barker, M D., of Drayton, Salop, & St. Anne's, Soho.

m. 1780, at Bolsover, Derby, Anne, only child of Brabazon Hallowes.

Kt. 16–4–64; F R S.; M P. for Wallingford; cr. Bart. 24–3–81. *DNB.; DIB.;* Hodson; Holzman.

CM., 8–11–52, Appd. Lieut. of the Company of Art. at Ft. William, but exchanged with William Wells [qv] to Ft. St. George.

Oct. 1753, Plan of Ft. St. George[2] [93].

1756, with Clive to Calcutta in comd. of Artillery.

Orme MSS XII (7), Plan of Chandernagore, surrendered 23–3–57, showing attacks by the ships under Admiral Watson, and troops under Clive. Plassey, 23–3–57.

"Survey of Country from Lakes behind Calcutta, through the Creeks to Ranga Fullar on the Hooghly, by Robert Barker, Engineer" [13].

1759–60, Comdg. Art. at Siege of Madras & battle of Wandiwāsh[3] [86]. Plans of Kārikāl & Madras [87].

Distinguished military career; C-in-C. Bengal 1769–73; left India 1773.

Papers on ice-making, meteorological obsns. at Allahābād, and on Benares observatory; *Phil. Trans.* LXV. 1775 (202, 252) & LXVII 1777 (598).

BARNARD, Thomas[4]. Mad. Engrs. & Civ.
b. 13–10–46. d. 31–3–1830.

Ens. & Writer, 1–11–65 ... Surrendered comn. in Engrs., 26–1–69 ... Senior Merch. 1776 ... Furl. 1787 ... Resd. 1790.

Son of John and Elizabeth Barnard, of Westminster. Younger bro. to Nicholas Barnard, Ens. Mad. Engrs. 7–9–61, who was killed at siege of Madura 1764.

m. Anne—, by whom he had a son, Thomas (b. Dec. 1789) who entered Bom. Civ. 1805.

Ed. at R M A., possibly not as cadet, but granted certificate by the Professor of Math., 19–9–64 [272]. W P. vol. v.; States himself that he had "been studying at a very considerable expence the different Branches of Learning requisite to qualify himself to serve your Honours as Engineer".

Nominated Writer, and "to be employed as an Engineer [268]".

3–10–65, Arrd. Madras on the *Ponsborne*; March 1767, Appd. by CE. to survey Madras *jāgir* [88, 141, 271, 272, 279, 283].

On the outbreak of 1st Mysore War, "The Fort of Tripassour being in but a very bad condition it is agreed that the Engineer do give Mr. Barnard, who is now on a Survey in those parts, directions to examine it, and to make such temporary repairs as may serve for its present defence, and while he remains there, he is to have command of the Place".

MMC. 7–12–67, hearing of the intention of Haidar Ali "to plunder the Country", the Council ordered "Mr. Barnard to proceed to Tripassoor, and establish Signals to be made from that place to Pundamallee, and from thence to the Great Mount, which done, he is to send out people and fix Signals to be made from Coverpauk and Bomerauz's country, or at least from Conjeveram to Tripasore, which signals are to be repeated from each place, on the approach of any of the enemy's Horse"[5].

July 1769, Appd. to accompany a member of Council "to proceed thro' the Jaghire, and make enquiry into the losses sustained by the incursions of the Enemy's Horse in September 1767".

Oct. 1771, Appd. Agent for the provision of *chunam* [lime], for use on the defence works "with a recompence for his Trouble proportioned to the quantity he may deliver"[6].

1773, Completed his survey of the *Jāgir* after many interruptions, and submitted maps and reports Nov. 1774 [141–2, 143]. His survey was carried out on the soundest principles, and did justice to the professional training received at the RMA [189–90, 272].

Records that he took a personal hand in dragging the chain, a remarkable evidence of his zeal [189].

10–11–74, Submitted application for furl.; "My health having been very much injured in the course of the above, ... and having suffered under it for near a year. with little or no material relief from medicine, I am advised...to go to England". He was allowed to take passage by a French ship which sailed from Pondicherry Feb. 1775, and was granted leave to return to his duties, June 1777.

1785, granted furl. from the Council at Masulipatam, and once again took passage by French ship from Pondicherry.

Settled in Sloane St., London.

BEATSON, Alexander. Mad. Inf.
b. 1759. d. 15–10–1830.

Ens. 21–11–76 ... Ret. Aug. 1813; Maj. Gen. 1814.

2nd son of Robert & Jean Beatson, of Kilrie, Fife; nephew of Alexander Read (qv).

Natural son, Alexander, d., Chingleput, 6–2–92, aged 8 months & 16 days[7]; natural son, Richard, bapt. 15–11–94[8]. m., 1806, Davidson, 2nd dau. of David Read, Comnr. of HM.'s Customs for Scotland.

DNB.; EIMC. I. (375 *et seq*); Portrait, *Genl. Mag.* iii. 1900 (394).

June 1776, Arrd. Madras, cadet, expecting appt. to Engrs.; Oct. 1776, Survd. Blacktown and St. Thomé Redoubt [143]. After 2 years attd to Engrs., appd. Qmr. of Brigade; 1777, with Mad. Eur. Regt. at siege of Pondicherry.

10–12–78, Appd. Engr. at Muslipatam, where he remained till 1782, then joining army in the field, 2nd Mysore War. Appt. to Engrs. definitely refused by Directors, 2–2–81.

1786, Appd. to Corps of Guides as senior Capt. under Pringle, succeeding to comd. in 1788 [6, 97, 109]. Whilst with Guides did valuable survey from "Circars to Cape Comorin" [110, 174, 272, 287, 298]. 1787, Survd. Palnād [110, 193].

M to CD. 6–2–89, Govt. forwarded to the Directors a "letter from Major Beatson, with a large Map of the Coast of Coromandel, made by that officer...for the purpose of assisting Mr. Dalrymple's object of forming a General Map of India", which the Directors acknowledged in flattering terms [109–11].

[1] d. 1751, Ft. St. David. [2] *Imp. Lib. M & P.* (366). [3] Orme II (458, 521). [4] H M S. 777 (161) is letter 29–1–1817 from Warren Hastings to "Sir Thomas Barnard of Mad. Est." & mentions "Lady B.", but indentity is not confirmed. [5] cf. the line of visual Telegraph Towers laid out through Bengal in 1817 by George Everest. [6] M to CD. 28–2–72. [7] Cotton (179). [8] Mad. Eccl. II (226).

During 3rd Mysore War, 1790, with the Centre Army under Kelly (qv.) as Capt. of Guides, when "Col. Kelly...detached Capt. Beatson, an officer deservedly high in his confidence...to ascertain the practicability of entering Mysore by the Mugly[1], a pass hitherto but little known"[2].

During remainder of the war his knowledge of the roads and passes proved of the utmost value, and Lord Cornwallis writes; "The army with all the artillery, stores etc., has ascended the Ghauts through the Moogly pass, without any material difficulty or accident; and in justice to Captain Beatson, the Captain of the Guides, I must add that his exertions, and the accurate knowledge which he had obtained of the pass, were of essential service"[3]. We are further told that he "was employed in conducting all reconnoitring parties, whether for the purpose of ascertaining the nature of places to be attacked, of camping grounds, or of routes by which the army was to march. On these occasions he generally returned to camp with sketches and observations...always acceptable"[4] [7, 253].

From 1792 to 1795, when he returned to England on sick leave, he was Town Major at Madras [111].

1792, Consulted by Govt. on Kistna–Godāvari irrigation scheme, which he warmly supported, showing in his reply a clear appreciation of the principles of canal construction [105–6]. 1797, after death of Topping, wrote to the Directors from Bath, asking permission to return to India, and offering his services for completion of surveys required for this project. Claiming to have been employed on surveys since 1776, he asked that he might succeed Topping as "Chief Surveyor", and the Court wrote out to Madras, "We are extremely desirous of availing ourselves of his services in continuing the investigation began by Mr. Topping, in order to ascertain the practicability of appropriating the waters of the Kistna and Godavery to the purposes of cultivation. We therefore direct that Captain Beatson be employed on his particular service, with the same allowances as were given to his predecessor, Mr. Topping"[5] [280].

Feb. 1798, Arrd. back in Madras and placed under orders of Board of Revenue; travelled up to Ellore, examining country as he went [107, 286].

Suggested that a rapid survey of the whole of Masulipatam and Rājahmundry Circārs would be useful, and would willingly undertake it himself "if the states of my health would permit, but, unfortunately for myself, I have already suffered so much from the effects of the sun and heat of the weather [this was in June], that I am discouraged from attempting a task so laborious"[6] [7, 106–7, 290].

But he was not to be left in the wilds to continue his professional work; "on 7th July, his survey was interrupted by an express from General Harris [acting Governor Feb. to Aug. 1798], telling him to go down to Masulipatam immediately, prepared to embark in a ship that would call for him. There he found orders to proceed at once to report to the Governor General" in Bengal[7].

Trouble was brewing with Tipu, and Lord Mornington, who had just arrived from England, had written to General Harris, June 20th, "If you could dispatch your answers to my questions by any fast sailing vessel, and could send with your answers any intelligent officer, who might be capable of entering into all the details of your force; of the seasons, and all other circumstances connected with the object of striking a sudden blow against Tippoo before he can receive any foreign aid, you would greatly assist me". Harris replied, July 6th, "I...did not hesitate in fixing on Major Beatson as particularly qualified to give your Lordship the fullest satisfaction on every point that you may refer to his judgement".

Lord Mornington awaited Beatson's arrival with impatience, writing July 18th, "The Frigate met with such bad weather on her passage that she could not touch at Masulipatam, and she arrived here without Maj. Beatson"; and then, Aug. 14th, "Major Beatson has been here for some time; I have received great satisfaction from his knowledge and ability, and I feel very much obliged to you for having afforded me the opportunity of forming so useful and amiable an acquaintance"[8].

Beatson was appd. A D C. to the GG. and, after arrival in Madras, "Surveyor General to the Army"; he was General Harris's most trusted adviser throughout the rapid campaign which followed [8–9, 118, 308]. He claims to have been responsible for the selection of the route followed by the army into Mysore;

"If I had not on my return from Bengal most decidedly opposed the first intended route of the Army to Seringapatam in 1799, it would have entered the pass of C., a route subsequently used by Lt.-Colonel Read, who experienced with a small detachment so many obstacles from rugged roads, steep ascents, want of forage and water, that there is no doubt if the Army had attempted it, all those evils would have been felt in a much greater degree, and in all probability it never could have reached Seringapatam in time, and in a condition, to undertake the siege before the setting in of the Monsoon. ... Had the attacks on Seringapatam, Bangalore, and Sevandroog (in 1791–2) or the route of the Army to Seringapatam in 1799...failed, the consequence might have been fatal to the public, as well as to my own character"[9].

When it came to the scheme for assault on Seringapatam, Beatson took a line directly opposed to that recommended by Chief Engineers of the Bombay and Madras armies; his was chosen by the C-in-C., and proved successful; "Just as the troops had got possession of the rampart, Col. Sartorius, after he had examined the intricate works of the south-west angle [the point of attack favoured by the Engineers], came up to Major Beatson, and in the most cordial manner took him by the hand, and addressed him in these words; 'I most sincerely congratulate you upon the success of your attack, for I am now convinced, it was the only mode by which Seringapatam could have been taken" (*EIMC.*).

Beatson had asked the GG. for privilege of carrying dispatches home to England on conclusion of the campaign, "this subject...I have very much at heart, since it holds out a fair prospect...to ensure...my return to India, ... together with my views in offering to the Court of Directors to complete the investigation of watering the Circars"[10].

The GG. consented, and asked if Beatson and Allan would carry the dispatches home overland, but they declined as it "was so likely to fail", but took them by the usual sea route, arriving in England at the beginning of Feb. 1800 [308].

3-2-1808, Beatson was gazetted Colonel and C-in-C. at St. Helena, an appt. which he held till 1813.

1800, pub. history of the 4th Mysore War, entitled *A View of the Origin and Conduct of the War with Tippoo Sultan*, illustrated with sketches and views, which is a standard authority [118].

[1] 57 K/15. [2] Mackenzie (136). [3] B. Pol. C. 16–3–91 (11). [4] *EIMC.* I. [5] CD to M. 9–5–97. [6] MRC. 27–11–98. [7] *EIMC.* I. [8] Martin (I 64, 67, 135, 216; II 173). [9] MMC. 8–9–1809. [10] BM. Addl. MSS. 13670 (199–207).

BLACHFORD, William Henry. Bom. Engrs. b. 10–10–60. d. 8–7–1841.

Ens. 1–1–80 ... Lt Gen. 27–5–1825.

Son of Mr. Blachford of Bombay. m. Bombay, 15–9–92, Miss Frances Dick. *EIMC.* I (175).

Arrd. Bombay, Aug. 1777. April 1790, Attd. as Engr. with Col. Hartley's force to Malabar ; survey of the marches [130]; Plan of Seringapatam[1].

After 1792, on survey of Bombay Town "to ascertain the superficial measurement of each house occupied by the garrison" [*EIMC.*].

1794–5, ADC. to the Governor, and Officer Suptg. the Works. BoGO. 2–1–96, resd. and struck off from 31–12–95; furl. from 1–2–96 ; Reinstated Aug. 1798 ; BoGO 5–6–1801, Supt. Engr. at the Presdy.

Furl. on sick cert. Sept. 1803 till death.

BLAIR, Archibald. Bom. Marine. d. 1815.

1st Comn. 1771 ... Capt. 16–10–92 ; Ret. 1800.

FRS. 2–5–99.

1771[2], Volunteer in Company's ship *Revenge*.

Low (186), "In 1772 was the first surveying expedition undertaken by officers of the Marine (Bombay), including Messrs. Blair and Mascall, midshipmen. These officers explored the coasts of Mecran, Scinde, Kattywar, and a part of that of Persia and Arabia [123] ".

1780–1, Lieut. of the *Betsy* "Cruizer" when captured by a French Frigate at the Cape, and delivered over to the Dutch. March 1784, the Directors resolved that the "be permitted to return with his rank in the Bombay Marine", but that "the claim for wages from 4–12–80, the time to which...last paid up at St. Helena be by no means admitted, but that in consideration of sufferings, and long captivity, be paid a gratuity of £ 200 as full compensation to... arrival at Bombay"[3].

1786, Attd. as asst. survr. with expn. sent to occupy Chagos I., and survd. the island, harbour, and surrounding archipelago, till Jan. 1787[4] [123-4].

1788, Deputed to Bengal, his first task being survey of Diamond Harbour and adjacent parts of Hooghly R. [51].

In Dec. received instructions for survey of the Andaman Is. with the particular object of finding good harbour for the Company's ships; also to report on vegetable and mineral products of the islands, and if possible open up friendly intercourse with inhabitants [5, 47, 278].

Coming back to Calcutta for monsoon he returned Sept. 1789, and established headquarters at Chatham I., in the " Old Harbour ", S. Island. March 1790, leaving Wales [49 n. 7] in charge of the settlement, " sailed with the *Ranger* & *Viper*, accompanied by Capt. Kyd [qv] in the *Experiment*, to prosecute the Survey, and with the intention to complete the circuit of the Andamans[5] [48–9].

The following is an extract from Colebrooke's journal on this trip [328];

1789, "December 25th, went on shore upon Chatham Island to take views ; this is a very small Island near the entrance of the Harbour, where Mr. Blair, the Marine Surveyor, has lately erected a small house with wood and canvas. He has already cleared away a great deal of the wood on the Island and planted a small garden. ... [328, *v.* Topping].

26th. "When the *Ranger* and *Viper* Briggs first entered this Harbour, the Natives were extremely hostile ; they attacked the Boats which went ashore for water, and even ventured to approach the vessels and discharged their arrows at them. One of the crew had an arrow shot through his shoulder, and probably some would have lost their lives had not the timely discharge of two or three muskets put a stop to their attack. In one of these skirmishes a native was unfortunately killed, upon which the rest ran off making the most doleful lamentations"[6].

Blair remained as Supt. of the Settlement till 1792, and established friendly relations with the inhabitants, so much so that it is recorded that "the two Andaman Islanders lately brought from our settlements on those islands by Capt. Blair are both well formed, and their countenances much more agreable than the African. ... The elder is about 20 years of age, & rather of a serious disposition ; the younger about 15 very lively and free in his manners"[7].

Dec. 1792, Govt. sent orders for Blair's relief, "The circumstances of your situation on the Bombay Establishment rendering it of consequence to you to be on the Malabar Coast, and the Services of a Surveyor being now less wanted at the Andamans than those of an Engineer; Captain Kyd has been appointed to be Superintendent, and is to receive charge in 4 or 6 weeks" [5, 49].

Blair duly handed over, and submitted his final report at Calcutta in May 1793, his last duties in the Andamans being the transfer of the Settlement to the new Port Cornwallis in the North Island, where he constructed several houses, and a small battery of 9-pounders[8]. His first settlement had been in the South Andaman, at the present Port Blair [49].

His original charts are now preserved at the British Museum, and include several coloured views by his assistants, Test and Wales [49 n. 7][9]. It is recorded, BPC. 14–9–93 (9), that "Mr. Brittridge only struck off 80 copies of the chart of the north part of the Andamans which, with the copper plate, was sent Colonel Kyd".

Blair returned to England 1795, sailing in the *Panther* to Suez. In 1803, Government allowed him a commission on all cotton belonging to the Company exported from Bombay, as a reward for his invention of 'engines' which effected a "considerable improvement in the packing of cotton"[10].

4–4–99, Read account of the Andaman Is. before Royal Society.

Settled at Bayford, Herts.

BLUNT, James Tillyer. Ben. Engrs. b. 1765–6. d. 20–10–1834.

Ens. 15–2–85 ... Capt. 1–1–1806 ; Ret 9–2–1810.

Ed. Merchant Taylors'.

m., Calcutta, 3–9–96, Miss Mary Bristow, sister-in-law of R. H. Colebrooke [qv].

EIMC. III (290) ; Hodson.

Sept. 1783, Arrd. Calcutta as Inf. cadet; tr. to Engrs. and studied under Burrow [271]. Asst. Engr., Cawnpore. June 1787, Appd. asst. to Burrow on astr. survey [157, 158], with him up the Ganges to Patna, but on arrival at Dacca at the end of Oct. went down with fever [158, 318] ; on recovery was posted as Asst. Engr. at Monghyr.

[1] BM. Addl. MSS. 13906 (d). [2] Mar. Rec. Misc. 680, 20–11–71. [3] CM 10–3–84. cf. CD. to Bo. 16–3–84. (57, 58) & Mar. Rec. 492. [4] Bo. F & P 16–1–86 & 27–11–86 ; cf. Blair's *Memoir*, pub. 1789 (Dalrymple). [5] Blair's Report, BPC. 31–5–93. [6] Journal, DDn. 10. [7] *CG.* 27–9–92. [8] *CG.* 31–1–93. [9] *Twelve Views of the Island of Bombay and its Vicinity.* John Wales. (IO Lib.) [10] IO Misc. 7–3–1803 & CD to Bo. 1–6–1803. RS. Lib. MS XI (93).

Aug. 1791, ordered on service to Mysore; sieges of Sevandroog and Ootradroog; in charge scaling ladders at assault of Seringapatam, 6–2–92.

On conclusion of peace attd. as asst. to Anburey [qv], survd. route of Nizām's army from Seringapatam to Hyderābād, and from Oct. 1792 survd. a line through Berār and Bundelkhand and to Kālpi and Cawnpore; then posted to Dinapore [43, 116, 322].

1793–4, Asst. to Reynolds on survey Allahābād-Delhi-Pānīpat-Hardwār-Lucknow [55, 132]; April 1794, described *Jantar Mantar* obsy. and *Quttab Minar*; sketch of latter engraved by Upjohn; measured height of Qutb trigonometrically, but could not climb to read date of erection[1].

After rejoining at Dinapore, tr. to Ft. William.

Dec. 1794, selected for survey from Chunār to east coast; left Chunārghur, 28–1–95, and after adventurous journey got through to Ernagūdem near Rājahmundry before end of May [8, 59–63, 167, 187–8, 299].

4th Asst. to SG. from 1796 [271], making several small local surveys [51, 65]. Held temporary charge during SG's absence on survey 1796–7, and again 1801–02; 1798 appd. Barrack Master, Ft William, in addition to his other duties.

An account of his later services, which included survey in Orissa during 1803, will be given in a later volume.

BOGLE, George. Ben. Civ.
b. 1746–7. d. 3–4–81, Calcutta; MI. S. Park St. Cem.

Writer, Dec. 1769.

DNB.; *DIB.*; Stewart; Clements Markham (cxxxv–clix).

Arrd. Bengal 1770. Mission to Tibet, May 1774 to Aug. 1775 [23 n. 5, 73–4, 204]; corroborated identity of Tsang-po and Brahmaputra [80].

Collector of Rangpur, 1779–81; personal friend of Warren Hastings [*v.* William Campbell, 325 n. 12].

BONG, George. Mad. Engrs.
d. 31–3–1801, Madras.

Ens. 11–12–80 ... Capt. 25–5–92.

3–12–80, CE. recommends for "the Corps of Engineers, Mr. George Bong, a Gentleman who served in that line in the Swedish Service for several years, and is warmly recommended by Lord Macleod, under whose protection he came from Europe, and has been employed with me for some time past"[2].

1–11–88, CE. writes; "Lieut. Bong having just finished a survey of the Northern Environs for about a mile beyond the Blacktown Wall of Madras, I propose he shall after the monsoon make good the deficiency in Mr. Barnard's survey"[3].

18–9–93, CE. writes to Bong "In your letter of 13th August I observe you mention your intention of collecting materials for a map of the country, but as that may detain you in the prosecution of the work ordered by Govt. I think it necessary to mention that the business you have to do at present is to be considered as Engineer's duty, and not Surveying". What was required was a report on the Forts and strong places in Bāramahāl and Salem[4].

13–6–95, CE. notes that Bong "has been engaging in Mercantile Transactions in the Bāramahāl, which are certainly derogatory to the character of a military man"[5]. 29–6–95 Bong placed on the Invalid List.

18–2–1801, CE. notes that Bong "is now, and has long been, suffering under suspension for his misconduct when in charge of the Works in Bāramahāl"[6].

BONJOUR, Noë Antoine Abraham. Mad. Inf.
b. 1731, at Avenches, Canton Vaud, Switzerland. d. 1807, Switzerland.

Ens. 11–9–57 ... Lt Col. 27–8–70; Ret. *c.* 1775.

Sailed as cadet for Mad. 1758.

Dict. de la Suisse.

With Clive to Bengal 1757; Lieut. Ben. Art. 2–12–57; returned to Mad.; Capt. of Pioneers 4–11–61.

1766, Survd. passes along Carnatic-Mysore border, submitting sketch with proposed fortifications [89, 240].

25–6–72, Comdd. dett. which captured Kaliyarkovil[7].

On return to Switzerland bought Bellerive, where he died. Member of the first Grand Conseil Vaudois, 1803.

BOUCHET, Father Jean-Venant. SJ.
b. 10–4–1655, Fontenay-le-Comte, France. d. 13–3 or 14–7–1732.

SJ. 7–10–1670.

1687, Member of expdn. to Siam; expelled thence 1688, went to Pondicherry and entered Madura Mission, 1689; left Madura to found Carnatic Mission 1702.

In letter from Pondicherry, 13–4–1719, described "the Coromandel and Fishery Coasts which he travelled on foot", and enclosed a "map of Madura and other missions", together with results of astr. obsns. at Pondicherry and other places, and more detailed geographical sketches[8]. From these D'Anville compiled his first map of the south peninsula of India [11, 86, 169, 210, 238].

Wrote a paper on *The Latitude of Cape Comorin*, pub. in *Memoirs de l'Académie des Sciences* VII (758). Other writings, are preserved in the library of the school of St. Genévieve, Paris.

BOUDIER, Father Claude Stanislaus. SJ.
b. 16–10–1686, in the diocese of Sens, France. d. 1757, Chandernagore.

1718, Left France for Bengal and after arrival Chandernagore established reputation as astronomer.

1734, at request of Rāja Jai Singh, went with a companion to Jaipur, returning about a year later. Made frequent obsns. for lat. and long. and also kept up a survey of part of his route [11, 149–50].

D'Anville describes him as "Très habile dans l'Astronomie, qu'il a cultivée par inclination"[9], and uses his values for Agra [168], Delhi, and many other places. He also used his value for the latitude of Madras in preference to any other [169][10].

He further records that "the memoir made by father Boudier on his journey, furnishes the descriptions of places on this road [Agra to Bengal], with the computed distances of each from the course of the Gemne [Jumna] and the Ganges, between Agra and Helebas [Allahābād]"[11] [25 n. 2].

[1] Francklin (208 n.) & *As R.* IV. 1795 (313). [2] Mack. MSS. LXVIII. [3] cf. Norris [143]. [4] ib. LXIX. [5] ib. [6] ib. LXVIII. [7] 58 K/10; Orme MSS. 333 (32). [8] Bessé (19). [9] D'Anville (6). [10] Jefferys (8). [11] Herbert (25).

Rennell still used Boudier's values as late as 1793 [152]; he also used his survey of the road from Korah to Agra for his general map of Bengal of 1774 [226 n. 7].

In 1786 Bernouilli pub. all the obsns. made by Boudier between 1731–5, and also a map by him of a portion of the Ganges from Delhi to Chandernagore[1].

Letters from Boudier on astronomy are preserved in the library of the school of St. Genévieve, Paris, and at the library of the Paris Observatory.

BOURGIGNON d'Anville. see D'ANVILLE.

BROOK(E)S[2], William. Bom. Engrs.
b. *c.* 1754. d. 30–10–1838.

Ens. 25–10–83 ... Maj Gen. 10–1–1837.
m., Bombay, 11–3–94, Mary, sister of W. H. Blachford [qv].

Employed as survr. and draughtsman; "Plan of Bombay Fort; 200 ft. to an inch, 1793". July 1795, Resd. post[3] of dman. to CE., which interfered with his survey of town [120]; Bo MC. 13–10–95, re-appd. dman. to CE.

Bo GO. 1–11–1803; "Captain Brookes appointed to proceed with the survey of the Magazon Estate, and to continue it thro' the Island for revenue purposes and political utility".

Bo GO. 17–2–1806, CE. Bombay.

BROOME, Ralph. Ben. Inf.
d. June 1805, Bath.

Ens. 14–1–73 ... Capt. 2–4–81.
m. 1798, Charlotte, dau. of Dr. Charles Burney, widow of Clement Francis, Surg. Ben.
Hodson.

1777, Appd. to survey "the country adjoining Rajmoll, ... being recommended to the Governor General as skilled in surveying"[4], survey covering part of the Rājmahāl Hills [37].

Some time after, the Political Officer with Sindhia wrote to Warren Hastings from "Futtyghur[5]. ... You expressed a wish before I left Calcutta, that an Astronomer might accompany me if I travelled to the Westward. *Lt. Broome* who is here, and well known for his abilities in that line, would be very glad to accompany me in such an Expedition, & make such observations as you may please to direct. He says that he can at the same time Survey the country without the knowledge or suspicion of the inhabitants. He is Deputy Judge Advocate at this station. ... My Expedition will be but temporary"[6].

Resd. 5–2–85, proceeding to England, where he was "permitted to remain till his health is restored". Dec. 1790, requested "permission to return to his rank in Bengal as soon as released from attendance at the Trial of Mr. Hastings"[7]. Author of a paper dated Nov. 1790, *Elucidation of the Articles of Impeachment against Warren Hastings*[8].

After return to India became Judge Advocate, Bengal.

BROWN, Thomas Crockat. Ben. Engrs.
b. 1759–60. d. 18–10–93, at sea.

Ens. 9–4–77 ... Capt. 3–8–82; Furl. 1–12–85.
Hodson.

Son of Thomas Brown, of Johnson Burn; had three bros. in India; Andrew in Bengal, Adam in Madras, and Henry in Bombay.

Will sd. 28–4–92, Berhampore[9], with cod. Madras 24–7–93.

Possibly the "Captain Browne" who about 1781 made a rough sketch of "the Southern Part of the Zemindary of Benares"; with the assistance of Charles Crawford[10].

1784–6, Survd. Benares City and Environs [38]; receiving compensation of Rs. 3,000 on claim for Rs. 8,000 for expenses.

BRUCE, William. Ben. Inf.
d. 1–5–83, Calcutta.

Ens. 16–9–67 ... Maj. 7–5–81.
Hodson.

Nov.—Dec. 1767, Survd. route of 19th Batt. of Sepoys "from Fyzabad to Mamdy[11], from thence crossing the river Gogra to the forests at the northern extremities of Shujah Dowlah's dominions, and back to Fyzabad; with a plan of the fort at Mamdy", and on another occasion, with the Wāzīr, from Fyzābād "to Sanauli and Buckrah, and back to Oud", [29 n. 4][12].

About 1771, explored country S. of Mirzāpur towards headwaters of the Son and Narbada [30], possibly the survey referred to by Rennell [183].

Attd. to Engrs. during Rohilla campaign of 1774, Champion writing to Sel. Com., 12–3–74 [224];

"As there are several Forts in the countries against which the Vizier had demanded our aid, I took it upon me...to appoint Lt. William Bruce to act as Engineer. ... Lt. Bruce has been further advanced into the Countries against which our Force is destined, and has therefore acquired a more perfect knowledge of them than any officer I know; his abilities as an Engineer have been so well certified to me"[13].

The appt. did not meet with the GG'.s approval, but was allowed to stand till an officer of Engrs. could be sent up.

"Lt. Bruce can have no just cause to complain; he has already had indulgencies in the service to which his rank could give him no sort of pretensions; your particular regard for him...may be one reason for shewing him favour, ... but I must confess that some parts of his conduct have appeared to me exceptionable"[14].

Employed in reconnaissance in advance, making "a Plan of a Rohilla Post", and "being recognised by people who had seen him surveying, created suspicions of our intention [76]"[15].

4–8–80, Led storming party at capture of Gwalior[16], 24–3–81, and with Camac at victory of Mahatpur[17] [324].

BUCHANAN, Francis. Ben. Med.
b. 15–2–62, Callendar, Stirling.
d. 15–6–1829.

Asst. Surg. 1794; Resd. 14–8–1816.
4th son of Thomas Buchanan, of Spittal, Leny & Bardowie, and Elizabeth his 2nd wife, dau. of John Hamilton.
FRS.; D L. co. Perth, 1826.
DNB.; *DIB.*; Buchanan; *Ben. P&P.* 1915 (190).
After retirement, on death of elder bro. adopted mother's name Hamilton, and became known as Buchanan-Hamilton; 1816, inherited family estates on death of nephew.
Ed. Glascow; M A. 1779; Studied medicine at Edinburgh; M D. 1783. Made several voyages to East as ship's surg. before appt. to Ben. Est.

[1] Bernoulli ii (117, 429). [2] Bombay records use spelling BROOKES. [3] Bo MC. 19–8–96. [4] BPC. 3–2–78. [5] Fatehgarh, 54 M/11. [6] BM. Addl. MSS. 29145 (333) (undated). [7] CM. 22–12–90. [8] I O. Tracts. 183. [9] 78 D/8. [10] DDn. 126 (138), 29–4–1812. [11] Muhamdi, 63 A/1. [12] *I O. Cat.* (225) & Orme MSS. (134); Oudh, NE of Fyzābād, 63 J/1. [13] HMS. 221 (21). [14] HMS. 221 (320). [15] B Pr C. 14–2–75. [16] *v.* W. N. Cameron [315]. [17] Grier (III).

Feb. 1795, Appd. surg. to Symes' Embassy to Ava, and, during visit to Andaman Is. and journey up the river from Rangoon, not only made collection of plants, but collected new and interesting information about geography and peoples of Burma. In submitting report to Govt. two years later he claimed with justification; "I imagine that there is no place of any considerable consequence in the Burma Empire to the westward of the Martaban River [Salween] or between Martaban and Siam, but what some account of its situation will be found in these materials, not indeed such account as will enable the Geographer to lay them down with precision, but enough to give him a tolerable idea of the situation of the greater number [8, 84–5]". "From these papers the SG. was able to prepare a *Draught of the Burmah Territories and Eastern Countries*[1], and 30 years later Dr. Crawfurd[2] writes of his map of Burma, "Much of the interior of the Birman dominions is from the sketches of Dr. Francis Buchanan Hamilton. ... Recent and actual enquiries have in many cases confirmed the geographical speculations...of this gentleman"[3].

On return of mission, stationed at Lakshmīpur at mouth of the Meghna, and from there sent on botanical expns. to Chittagong. Held temporary charge of Botanical Gardens at Sibpur for a few months.

Biography concluded in Vol. II.

BURGESS, Thomas. Ben. Inf.

Ens. 1769 ... Capt. 18–9–80; Resd. 9–12–82. Hodson.

Probably 1776, made surveys and maps of the Ganges from Rājshāhi to Pabna, with Creeks & "Poolbunds" [Embankments] with proposals for river-training[4].

BURROW, Reuben. Mathematician & Astronomer.

b. 30–12–47. d. 7–6–92, Buxar.

1–12–83, Appd. Math. Teacher to Engr. officers at Ft. William [270–1].

25–6–87, Appd. to take astr. obsns. for lats. & longs. [5].

b. at Hoberley near Shadwell, Leeds; son of William Burrow, a small farmer. Ed. at Mr. Crookes' school at Leeds; schooling interrupted by farm duties.

m., 1772, Miss Anne Purvis, dau. of a wholesale poulterer in Leadenhall St., London.

To India 1782, wife and four children following in 1790.

His legitimate son, Charles, was b. at Shoreditch 3–7–81; entered Mad. Inf. as Ens. 29–8–97; became Lieut. 12–10–98, and d. 8–12–1803 at Cuttack, presumably on active service.

DNB.; *DIB.*; *New Monthly Mag.* I (126, 537); *Mech. Mag.* 51 (244, 293, 350); 53 (267); 55 (324–7). Original Journals in R A S. Lib. & I O. Lib.; *Ben. P&P.* xlvii; 1934 (49–50).

July 1765, aged 17, Burrow left Yorkshire and travelled to London in less than 4 days, mostly on foot, spending only 1*s.* 10*d.* on the way. He became clerk to a timber merchant for a year, and then usher to a writing master of Bunhill Row, and for a short time was teaching at Portsmouth.

1770, Appd. engr. to a projected expn. to Borneo, which however came to nothing. The same year was appd. asst. to Maskelyne, AR., at Greenwich, finding time to take private pupils. 1774, Assisted Maskelyne in obsns. for terrestial attraction at Mt. Schehallien in Scotland[5]. Writing of Maskelyne's method of seting the sector in the plane of the meridian, Burrow says, "I did all the surveying, and found out all the methods for doing it. ...I had put up all the Instruments, and drawn the meridian line, and put the instrument in order, when he had put it out of order and did not know how to put it right again"[6].

1775, Applied without success for the place of Math. Master at Christ's Hospital; but the following year, through the influence of Henry Watson [qv], he obtained the appt., on a salary of £ 100 a year, of "master to teach mathematics to the Cadets of the Drawing Room" at the Tower of London[7].

"The R M A. at Woolwich was not originally established for the education of Gentlemen Cadets for the Royal Artillery but...of the Corps of Royal Artificers. A school for the Artillery officers had been established in the Tower as far back as the reign of Charles the Second. ... The school in the Woolwich Arsenal was however, by degrees converted to the use of the Cadets, and the mathematical school in the Tower was merged into the Drawing School of the same Fortress. ... The whole of the Tower part of the establishment was then designated as the Drawing Room in the Tower, but while the Woolwich Academy was gradually absorbing the Cadets, and eliminating the N.C.O's, the Drawing-Room was the school in which the aristocratic portion of the Cadets was still priviledged to acquire their modicum of preparation for a Commission"[8].

From about 1775 to 1782[9], Burrow was editor of "*The Ladies DIARY or Woman's Almanack*...designed for the use of the FAIR SEX." which consisted of a calendar, interspersed with "Aenigmas, Rebusses, and Mathematical Dissertations"; the title was changed more than once. This Almanac had been started by the publisher with the definite purpose of dispossessing "the Stationers' Company of their pretended exclusive privilege of printing almanacks, which they had usurped for 2 centuries", and the challenge was successfully carried through the law-courts. "The Contributions to this periodical were mostly men of distinguished abilities, many of whom afterwards attained to great eminence in the Literary and scientific World"[10].

The rival almanac was edited by Charles Hutton, the distinguished mathematician [248]. Burrow records that "Hutton is allowed £ 100 a year by the Stationers' Company on condition of not making any almanacks...except for them. Hutton bye the bye does not know how to make an Almanack"[11]. It is not surprising to learn that there was at this time "strong hostility between the Tower and the Woolwich Schools"[12].

During his time at the Tower Burrow gave private tuition to several pupils. He also published various mathematical papers, amongst which were

A Restitution of the Geometrical Treatise of Apollonius Pergaeus on Inclinations; also the Theory of Gunnery, or the Doctrine of Projectiles. London 1779[13].

A new and Exact method of placing a Zenith Sector in the Plane of the Meridian.

A new and Exact method of finding the time and Longitude at Sea [151][14].

[1] BMC. 18–3–99, (44). [2] Chief Comn. Rangoon, 1826–7; name often spelt Crawford. [3] Crawfurd. Appx. xiv (88). [4] MRIO. 164 (14), 166 (8). [5] *Phil. Trans.* 1775 & 1778 Abr. Edn. xiv. (408). [6] Journal, R A S. Lib., 10–9–75. [7] ib. 16–1–76. [8] *Mech. Mag.* 55 (324, 327) 25–10–51. [9] He was living at this time at 11 New Sq., in the Minories. [10] Several copies in RAS. Library. [11] Journal, RAS. Lib., 17–8–75. [12] *Mech. Mag.* 55 (324). [13] One copy in library of R A. Institution, Woolwich. cf. *Ben. B & P.* xlvii. 1934 (49–50). [14] RAS. Library.

Of his mathematical ability it is said "The ability and elegance of Burrow's geometrical investigations are admitted by his critics"[1].

"To the mathematicians of the English school the name of Reuben Burrow is as a household word; and, as a geometer, there exists no question that he was only second to Dr M.S. of all his contemporaries"[2].

In capacity as math. master at the Tower he was deputed by the M G O. on two occasions to take young cadets out on survey:

"In 1777 I was ordered to take several of the Gentlemen of the Drawing Room & Woolwich Cadets, & to make a compleat survey of the sea coast from the Naze in Essex to Hollesby Bay in Sussex[3] including the 3 large rivers, Stour, Orwell, and Deben up to Manning-tree, Ipswich, and Woodbridge, together with the Islands, Sands & Soundings, etc., in & about Handford Bay, Harwich Harbour, etc. As there had never been a plan of the kind before but what was excessively erroneous, I did the whole with great care & exactness, & Plans were delivered to the King & Lord Townshend [then M.G. of Ordnance], but I never received a farthing for my trouble.

"I was likewise ordered last year [1781] to make a survey of Woolwich Warren: & in doing it, I was obliged to lay out about £ 7 from my own pocket: this £ 7 with great difficulty & after a long and ineffectual application, ... I got returned, but never received a farthing for doing the Business itself"[4].

He persisted in his claims without success; "If the Porter of the Drawing Room...is to be paid 8 or 9 shillings a day besides his usual wages every time he carries a letter as far as Blackheath, I see no reason why the Mathematical Master of the Drawing Room should work day & night, Sundays & all, for 6 months together, on a business of *real* importance & public utility, and yet be allowed *nothing*; when at the same time that wretched compiler of other men's productions, the Mathl. master at Woolwich [Hutton] is paid with profusion for *his* extra services, ... & his scholars never made ½ the improvement that those of the Drawing Room did in the same interval.

"The survey of the coasts of Essex & Suffolk was done, without any written order, by Lord Townshend's verbal commands, which were given me by his Ldp. himself, at the time he was down at Landguard Fort"[5].

1782, Burrow decided to resign his post at the Tower; he was on bad terms with his superiors and saw no prospect of advancement; he had an interview with the Duke of Richmond, now M G O., and explained his reasons for wishing to leave:

"that the place was likewise disagreable on some other accounts, particularly the dirty behaviour of the chief draughtsman, & that I had an increasing family, & £ 100 a year was not sufficient for a man to save anything by..."

"I wrote a long letter to the Duke giving my sentiments on the State of the Drawing & the means of Improving it; which I proposed by superannuation of the Chief Draughtsman & his Deputy. ...

He visited the Board but "the Duke behaved like a mean dirty fellow, & told me he would advise me for future not to abuse the officers, ... at which I looked at him with all the insolence and blackness of hell, & told him that my behaviour was very proper for theirs, & that I did not chuse to put up with impertinence from anybody".

It is interesting to note that shortly after Burrow's resignation, a warrant was issued, 4–9–82, "for reducing the Establishment of the Drawing Room at the Tower, and augmenting the Company of Gentlemen Cadets"—"Whereas it has been further represented to us, that the establishment of the Drawing Room at the Tower seems ill-calculated for instruction, and might be considerably reduced...and the savings... beneficially applied to the aumenting the Company of Cadets, ... our will and pleasure therefore is, that the Drawing Room at the Tower be reduced...and the Mathematical Master...be transferred to the R M A. at Woolwich; ... to be carried into execution from 1–10–82"[6].

Burrow now decided to take advantage of a suggestion made by his friend Henry Watson, CE. in Bengal, that he should go out to Calcutta and find employment there [268].

He sailed from Southampton in the *General Coote* Sept. 12th, in company with a contingent of Hanoverians [99 n. 4]. Whilst waiting to sail, "on 29–8–82, the Royal George, a 200 gun ship at Spithead, sank in about 13 fathoms of water. ... Admiral Kempenfelt was on Board, and drowned with the rest" [330]. Burrow describes the disaster, and wrote to the Admiralty suggesting a method by which the ship might be refloated.

He took with him a set of astr. instruments [204], and in his usual intemperate language records that on the day of sailing, "In the afternoon the Captain shewed me a letter he had received from Arnold the watchmaker, wherein the Scoundrel had pretended that it was in consequence of an expression of mine that he did not send Capt. H— a watch; this exasperated me so highly, that I wrote him a most bloody letter, & shewed it to Capt. H—, & his wife took it with her on shore"[7].

The following extracts from his journal show that he did not enjoy the passage, and found no kindred spirits amongst his fellow passengers.

"Damn the Latitudes! I took them every day, and intended to have kept a Journal, but had no place to write in alone. ...

"I took the earliest opportunity of trying the method of finding the Latitude by observing how long the Sun took in ascending its diameter, according to the rule given by Lyons, ... but I did not find it answer. ... I also attempted the method by the moon, but not having a watch that could be depended on, and having nobody on Board capable of helping me, I never got a good observation. ...

"Last night got an observation of the moon's distance from Fomalhaut, gave the Long. 19° 2′ west of Greenwich. I deduced the time from the altitude of the moon. I took the distance, and two of the mates took the Altitudes, but out of the 3 sets of observations only one was anything like right. ...

"I expected when I came on Board to have found some of the officers qualified for making such observations and calculations as were at least absolutely necessary, but except the Captain I did not find anyone that had the least knowledge of such matters; they did not even so much as know how to allow for the change in the Sun's declination, nor how to take out the proper refraction in finding the Latitude from the Sun's meridian, and they were likewise so conceited and ignorant as to be above being shewn".

He made trouble about his cabin; "What I the more particularly wanted was to practise Drawing in order to improve myself, as I was very deficient in that article, but I could scarce get an opportunity".

He gives a panorama of "Trinidada", and on 26–11–82, when they got into the Bay of St. Salvador, he wrote to the Governor, "Mr. Reuben Burrow, an English Astronomer, on board the General Coote, East Indiaman, to Marquis of Valencia, Governor of St. Salvador, asks for liberty of making some astronomical observations on shore, for the purpose of determining the Latitude and Longitude, magnetic variation and other similar matters". ...

[1] *DNB.* [2] *Mech. Mag.* 55 (324). [3] A slip for SUFFOLK, corrected later in Journal. [4] Journal, R A S. Lib. II. 2–5–82; cf. Jones (29) Letter from M G O. 12–2–79, asking for plan of Woolwich Warren. [5] Jones (28) records that during 1777–8 there were "certain gentlemen of the Upper Academy on duty at Landguard Fort". [6] Jones (39). [7] Journal, R A S. Lib. II. 12–9–82.

"On Jan. 1st 1783, gave Captain B. the Longitude 29° 44′ W., Latitude 20° 31′ S., and variation of compass 2° 3′ W. of the Island of Trinidad"[1].

Soon after his arrival in Calcutta, Burrow wrote to the GG., Warren Hastings, urging the value of research into the writings of the Hindus on the subject of Astronomy, and a study of the construction of the astr. observatory at Benares [150], and offered his services in making these investigations, and also in making such astr. obs. as would give a sound basis to the surveys of India [156–7].

He followed this up on 12–6–83, "The favourable attention you were pleased to show to the Hints concerning the Observatory at Benares, which I had the honour to lay before you by means of Colonel Watson, emboldens me to inform you of the motives by which I was induced to come to India....

"When I first applied to the study of mathematics, I commenced with the works of the moderns. ... I...endeavoured to discover some preferable mode of investigation...& luckily I hit upon...the works of Archimedes and the Conics of Apollonius. ...

I looked upon it as some consequence to the world, & was by this time convinced of the probability of the existence of several of those MSS supposed to be lost; I concluded that the best method of answering every purpose would be to go to the East Indies for a few years, & while I made myself master of the necessary languages, to endeavour to acquire a sufficiency of money; afterwards to go thro' Arabia, Persia, & Tartary, or any other parts where there was a probability of meeting with those works, ... & having made a collection of everything curious, & useful, & carried on a series of Astronomical and other Observations, to return to England, and Employ the remainder of my life in publishing such things as I might meet with. ...

"These were some of the motives which induced me to leave my friends, my family, and a maintenance not ungenteel, to come to India [156, 268]"[2].

A few months later Watson found him a job on a regular salary, Rs. 500 a month [278, 280], as teacher of mathematics to young Engr. officers [157, 270–1]. Watson writes,

"The Gentleman I wish to recommend...is Mr. Reuben Burrow, who has been induced to quit his Native Country in search of the supposed hidden Treasures of Ancient Learning, which he hopes to meet with in the Hindoo and Mohamedan Repositories of Asia.

"I am happy...to have an opportunity of making known to the Board, as a specimen of the uncommon abilities of this Gentleman, some very curious and interesting discoveries that he has already made. ...

"In the first Instance, ... he has determined those famous Periods of the Hindoos called the Five Yogees, which have been so often mentioned by ancient and modern Authors, and caused such numerous mistakes and conjectures amongst the Learned. ...

"He has also discovered that several Branches of Science, which were supposed to be the invention of Europe, were long since known to the Bramins; that they were acquainted with decimals, and Algebraic Computation, and also that they had determined the mean Motions of the Sun and Moon, and several other parts of Astronomy, to almost as great exactness five thousand years ago, as the Europeans have done in the present age" [148, 156].

In April 1784 Burrow wrote again to the GG. and reported "the discovery of several books that are entirely new among the mathematical MSS. he has received, ... [and] returns sincerest thanks for the favours he has received"[3].

In 1787 came Burrow's opportunity for the astronomical work which he had suggested in 1783, for he was officially appd. to make regular obsns. for lat. and long. for the better control of the maps [43, 157, 204]. To his great disgust he was placed under the orders of the Surveyor General, Mark Wood, who gave him a programme which did not meet with Burrow's own ideas; "no latitude was left to my own judgement with respect to the choice of times or seasons, or the order in which the different parts of the business was to be performed"[4].

With Blunt as asst., he travelled up the Ganges to Patna in July 1787 [209] and, after much loss of time due to monsoon weather, worked back to Dacca, where the whole party was overcome with fever, and Blunt had to be left behind [158, 313]. Burrow then worked up the Brahmaputra as far as Goālpāra, having a difficult time with sickness and shortage of supplies; on his return he travelled through the Sundarbans, and reached Calcutta once more in Jan. 1788 [159].

The original programme of a journey round the coast of India as far as Bombay was here interrupted, and Govt. ordered him to Cheduba I, on the Aracan coast, to fix its position and make a survey, which he completed by the end of March [43, 201, 298].

He spent the rains at his house at Russapugla, to the south of Calcutta [160, 180], and then, finding that there was no prospect of carrying out the original programme, he obtained leave to travel up country on account of his health [161].

Leaving Calcutta Sept. 1788, he went up by river to Fatehgarh, and then by land across Rohilkhand to Hardwār, taking astr. obsns. all the way. He also made such geographical surveys as he had time for, and sent out pundits to collect routes to Almora and other places in the Kumaun Hills [77, 234, 286].

He made particular enquiries for learned men with knowledge of astronomy, and picked up a number of Hindu MSS. on the subject.

At the end of Feb. he received orders to return to Calcutta, and, on his arrival there, found that the Directors wished him to be employed on measuring the length of a degree for geodetic purposes, a suggestion that had been made by General Roy [164].

His journal, giving a full and most interesting account of these two seasons' work, and containing very neat panoramic sketches of Cheduba, is still preserved at the India Office[5]. The geographical points fixed by him from Assam to Hardwār were used by surveyors for the next 30 years [55, 163, 168, 180, 232, 234].

The work now assigned to him comprised the measurement both of a degree of Longitude as well as one of Latitude, but it was not commenced until April 1790, for the instruments which had been promised from England never arrived, and he had to

[1] Remarkably correct; True value, 29° 50′ W.; 20° 30′ S. [2] BM. Addl. MSS. 29159 (376–381). [3] BM. Addl. MSS. 29163 (113). [4] I O. Maps. MS. 5. [5] I O. Maps. MS. 5.

collect what he could in the country [202, 204]. He found Sir William Jones, President of the Asiatic Society in Calcutta, most interested in the work. He made his measurements in Nadia District and completed them by May 1791, but never found time to work out the results. His observations were, however, sent home to his friend Isaac Dalby, who worked them out as best he could and sent an account to the Royal Society in February 1796, which was afterwards published [165–6].

During the following season, 1791–2, Burrow made an expedition to Bihār, but while work was still in progress succumbed and died "on board his Budgerow at Buxar, on June 7th 1792 [43, 166–7, 268].

A full account of his valuable work in India is given else-where [55, 155–67, 171, 186–7, 202], and it only remains to speak of his vigorous, and somewhat crude, personality. His mathematical genius was outstanding, and was notable for his efforts to break away from the commonplace. He had a consuming zeal to discover all he could of the ancient learning of the Hindoos, as was witnessed by his mastering the Sanscrit language sufficiently to make his own translations of old manuscripts [156, 161, 268]. Several notes on astronomy in Gladwin's translation of the *Ain-i-Akbari* [133 n. 3] appear to have been contributed by Burrow, and one gives an interesting account of a Hindu method of measuring longitude, and of the construction of the frontispiece Hindu map[1] [208 n. 4].

Of the less attractive side of his character the following comments are quoted,

"A rough but kindly man, who sometimes drank too much, and would then indulge in pugilism".

"He amused himself by pouring out coarse abuse in the fly-leaves of his books"[2]. ...

"Mr. Burrow certainly possessed strong natural abilities, but his attainments were not confined to the mathematics; he could read and translate Latin, French, and Italian with Facility, and he made considerable progress in Arabic and Persian after he left England. His disposition was rather convivial, and he had a ready knack at writing doggerel verse".

"His form was athletic, and countenance expressive, with a penetrating eye but the *graces* had been somewhat neglected, and he possessed less of the *suaviter in modo*, than of the *fortiter in re*."[3].

A biographical memoir, written in 1821, by one who had obviously known him personally, records his liking for "rites of Bacchus"—indulgence in "pugilism"—"Protracted and midnight revels not uncongenial, but he was not of dissipated habits"—"Natural powers very great—Education defective—Heart good, but habits lacked prudent training"[4].

After the publication of this memoir there followed a long correspondence between Mr. W— who championed Burrow, and Mr. de M— who accused W— of having quoted Burrow seriously, without emphasizing his undesirable character.

Mr. W. replied, 3–5–1854; "I offer no excuse for Mr. B's. scurrility and obscenity, altho' something might be urged in palliation from the usages of the times in which he lived. ... I am still of opinion that his testimony...will hereafter be received as trustworthy in the main".

De M— continued the discussion, and gave the following specimen of Burrow's malignity;

"He had an excessive hatred of J. G— and W. W—, who were astronomers in Cook's voyages, and he had probably been beaten by them in some competition for places. Whenever he bought a work of either, he wrote some scurrility on the fly-leaf. ... On an editorial note he remarks, 'This stupid, pimping, affected, dull, pert, contemptible, vile, fulsome, nauseous, villainous note, the reading of which is enough to make a person spew their liver up, and to give the Devil a vomit, was written by W. W—'"[5].

His private journals were certainly filled with spiteful remarks, and bawdy rhymes, obviously of his own composition, but many of his entries have a homely and intimate touch;

25–9–75. "My wife's Sister Bet had got the Itch (at Lewisham) & the Doctors blistered her for it, till at last some woman had given her Brimstone". ...

28–10–75. Since the above was wrote, I lost my Ink bottle, & the damned Taylor made my Coat without a side pocket, which is the reason that I neglected to keep my Diary as I used to do".

Those written in India contain petty details about domestic housekeeping:

"August 1784. I have only 20 gold mohurs[6] left out of Rs. 500 that I received for the month of December; how it is gone, by God, I cannot tell, but it is all gone in a very short time. I cannot for my life find which way. I have bought nothing but a few books. ... What the hell can be the reason of all this?

to Jack	Rs. 9	Books	Rs. 10
Moonshy[7]	20	Silk & Co. for the girls	16
Barber	2	Gave Malton	6
Metranee[8]	3		
			Rs. 66

"I only remember these, and...the other must have gone in the house. ..." Then remembers Rs. 30 "the other I cannot make out for the blood of me. I have had no...nor any liquor in the house".

"16th day of March. Durzee came at 8 Rs. per month. Cut his tullep[9] for the Sunday, and cut it for another day that he did not come, and cut it for 2 days fine, and cut it for another 2. Paid him Rs. 4 in part".

After Burrow's death many of his possessions were put up for sale in Calcutta, including,

"A valuable collection of astronomical, mathematical, mechanical, chymical and other Books of Science, in different languages."

"A valuable collection of Shanscrit Books, with translations from the same in Bengally. Also a variety of Persian MSS. and 2 figures in Black marble of Boodh, the principal Hindoo Deity"[10].

This sale seems hardly in keeping with the provisions of his will, and it is to be hoped that they fell into the hands of some who appreciated them.

He contributed several papers to the journal of the Asiatic Society;

Hints relative to Friction in Mechanics.

A Method of calculating the Moon's Parallaxes... [180].

Remarks on the Artificial Horizons.

Demonstrations of a Theorem concerning the Intersection of Curves.

Correction of the Lunar Method of finding the Longitude[11].

[1] Gladwin II (349–50). [2] *Notes & Queries*. I (143). [3] *New Monthly Mag.* I. 537. [4] Memoir by J. H. Swale, *Mech. Mag.* 53,1850, (267 *et seq*). [5] *Notes & Queries* XII. 25–8–1855. [6] A Gold Mohur, 16 Rs. [7] Muhammadan teacher. [8] Sweeper woman. [9] *talb*, or pay. [10] *CG.* 30–8–92. & 13–9–92. [11] *As. R.* I. 1788; five papers.

A Synopsis of the different cases that may happen in deducing the longitude of one place from another by means of Arnold's chronometers[1].

Observations of some of the Eclipses of Jupiter's Satellites[2].

A Proof that the Hindoos had the Binomial Theorem.

The following extracts from his will give a sad view of Burrow's domestic life; it has been said, probably with reference to their early life in London, that "Mrs. Burrow owed black eyes and a swelled face to some of her husband's eccentricities...in private life"[3]. Relations do not seem to have improved after her arrival in India.

"I, Reuben Burrow, mathematician, being in sound mind, but in a very ill state of health, and given over by the doctor, and of course having very little expectation of living more than a day or two longer, make this my last will and Testament. ...

"I left in the hands of my brother John Burrow, and my father William Burrow, some chests of Books in trust in Yorkshire, and as the said John Burrow wrote me word that Mr. John Crookes, Teacher of Mathematics (my beloved and most friendly Instructor) *was dead*, which information was most wickedly false and gave me a long time great uneasiness; I therefore leave the whole of those books to my sister Mary Burrow. ...

"I leave to my lawful wife Ann Burrow the sum of one sicca rupee and no more. I also make it my dying request to my legitimate daughters that they would keep out of her company as much as possible, as lessons of wickedness are, alas, too soon learnt, and misery and repentance are always the consequence".

Remainder of money was to be divided in equal shares amongst legitimate and illegitimate children equally; "I have 4 legitimate children, Ann, Mary, Charlotte, and Charles, who were born in England; and four illegitimate children, Nunoo Burrow, a girl about 6 years, John Burrow, a boy about 4, Ann, and Oliver, all christened. ...

"Whereas my wife, since her arrival in India, stole and destroyed many of my private letters, and I left a large chest strongly locked up with many other letters, books, and papers, in my house at Russahpugly, with strict orders that it should not be opened in my absence; now, if this chest has been opened in my absence, or should be found opened by my executors, I hereby revoke that part of the aforesaid...bequest respecting my legitimate children, and instead of one 8th part...I give each of them *only one 12th part;* ... and the remainder or one 6th part I give one half to my sister Mary Burrow, and the other half to my most honoured and virtuous father, Mr. William Burrow of Rounday, near Leeds in Yorkshire, and in case of his death, his share I give to my brother Carmi Burrow, an industrious Shipwright at Whitby.

"My house and ground at Russahpugly I give solely to my illegitimate children, but not to be disposed of till they all come to age, and I will, and order, that my wife be immediately turned out of the house on my decease, and not suffered to stay in it by any means, nor have any communication with my illegitimate children. ...

"I appoint my most honoured and respected friends the Revd. Mr. John Owen of Calcutta, Mr. Francis Redfern Collector of Kishnagur, and Mr. James Agg, Engineer of Calcutta, my Executors.

"Written all with my own hand, the 14th of May 1792 on one leaf of paper at Caranfola[4] in Purneah, where there are no Europeans, and therefore the Witnesses must necessarily be black people".

[Two witnesses sign in Urdu, and one in Nagri].

"*Codicil.* I consider it as a matter of great consequence that the Sanscrit Learning & Sciences should be transferred to England, and therefore I wished to breed up my legitimate, or supposed legitimate, son Charles to the knowledge of that language and the mathematics; but as he has shown the most fixed determination against it, & obstinately refused for near 8 months together to learn anything I wanted him, I therefore annul & make void & revoke that part of the foregoing will which leaves him one 8th part of my money, and leave him instead, one twelfth part, and the difference I leave to Betsy Roshny, the mother of my illegitimate son John Burrow, and the rest I leave to be applied to the teaching of the said John Burrow the Sanscrit language & sciences"[5].

After Burrow's death, his family returned to London, where his wife and two daughters died soon after and the remaining daughter married. As has been already noted, the intractable Charles entered the Madras Infantry; no record has been found of the natural family.

BUSHBY, Ewan. Ben. Inf.
d. 5–2–93, Calcutta.

Ens. 13–9–79 ... Lieut. 30–4–81.

Hodson.

21–5–81, Ellore, Appd. D Q M G. with Pearse's force [41]; Nov. 1781, taken prisoner by Haidar Ali's forces, near Tripasur[6].

Dates unknown; DDn. 270 (39), Survd. route Anupshahr to Srinagar, Garhwāl; obsd. lat. at Tāj Mahāl, Agra [168].

BUSSY-CASTELNAU, Charles-Joseph PATISSIER, Marquis de. French Inf.
b. 8–2–20, at Ancienville near Soissons.
d. 7–1–85, Pondicherry.

Ens. Compagnie des Indes, 1736; Brig. d'inf. April 1758; LtGen. comdg. at Cape of Good Hope, 1782.

His father, Lt Col. Patissier, took name de Bussy, and Charles-Joseph bought the "marquisat de Castelnau" about 1756, confirmed by Louis XV at his 1st marriage in 1761.

Dict. Général; Martineau; *Memoires, Letters etc. Le Sieur de Bussy.*

With false date of birth, obtained comn. as Lieut. at age of 13, and Capt. at 15, under his father's comnd.; on father's death obtained comn. in the French EIC., and after service at Bourbon and Isle de France, arrd. India 1741.

1750, sent in comd. of French dett., 300 Europeans and 4,000 Sepoys, to support Nizām in Deccan; 1751, defeated Marāthas at Ahmadnagar. 1753, granted revenue of N. Circārs for payment of his troops, and during 1756–7 occupied Circārs as far as Ganjam, capturing English factory at Vizagapatam[7] [91, 115, 309].

July 1758, recalled to Pondicherry; 1760 captured by the English under Eyre Coote at Wandiwāsh [86], and returned to France.

1781, Sent out from France to support Haidar Ali with French reinforcements, but "found such difficulty in evading British squadrons"[8] that he did not land at Porto Novo till March 1783, and a few months later news arrived of peace between England and France. "The arrangements for the cessation of hostilities in India were made with Bussy, and the most amicable relations followed"[9].

During his command in the Deccan Bussy had surveys made of all his marches [118, 170], and the map compiled from them, described by Rennell as a "monument to the French nation", remained the sole authority for the geography of that country for more than forty years [115, 117, 245, 268]. Both D'Anville and Orme were proud to receive copies.

[1] *As. R.* II. 1790 (473). ib. (483). [2] ib. (487). [3] *Notes & Queries.* 3rd S. Vol. V (167). [4] Kārāgola, 72 O/7 ? [5] Ben. Wills. 1791–92, pr. 2–8–92. [6] *Mil. Repository.* II (18, 101). [7] Carmichael (172–5); *Im. Gaz. The Indian Empire.* II (472–3). [8] Roberts (198). [9] Grier, (292). *v.* Bio. Notes sv. Kelly.

BYRES[1], John. Mad. Engrs.
b. 1745. d. 23–9–88, Tanjore.

Capt. 15–12–78.

Youngest son of Patrick and Janet Byres of Tonley, co. Aberdeen.

m., Isabella, dau. of James Donaldson, M D. of Auchmull, co. Aberdeen, and had two daus. who did not accompany him to India.

No record of service has been found, either with EIC. or at home, before Feb. 1781 when appd. Capt., to rank from 15–12–78[2].

Passenger in *Deptford*, sailing from London 12–6–81[3]; trans-shipped at St. Helena to H M S. *Hannibal*[4]; captured by the French 22–1–82[5] by a French squadron under comd. of Adm. Suffren; "present...during the action with the British Fleet off Sadras[6], 17–2–82. Byres being seriously ill with fever was sent on shore at Porto Novo...on parole. ... Byres then asked to be allowed to serve in the north where there were no French, but Coote replied that he could not allow him to serve, as we were liable to be attacked by the French anywhere"[7].

He writes himself "I had the misfortune of being captured in my voyage out and lost almost everything I had; remaining 19 months a Prisoner of War; and that ever since my release I have been constantly in the field with the Southern Army"[8]. He was bound by *parole* till July 1783, when news of peace with the French reached Madras, and he might well feel aggrieved at not receiving any allowances for so long a period.

He was not even able to use his surveying instruments, for he writes in Sept. 1783; "I brought a complete sett of professional Instruments with me from London, which I have been lugging after me for better than two years at a considerable expence, tho' it would be perfectly convenient for me to dispose of them, and I have had more than one opportunity of so doing". He offered to sell them to Govt., but appears to have kept them on, for he made several surveys after joining Fullarton's army, taking astr. obsns. and submitting "A Draught of the March of the Southern Army to the reduction of the Fort of Poligatcherry and Coimbatoor, together with a plan of the former, and its environs. ..." [98, 170][9].

At the close of the campaign he acted as "Chief Engineer to the Southward, and sent in a detailed report of every particular respecting the garrisons of Tanjore, Trichinopoly, Madura, Palamcottah, and Ramnad[10].

1787, carried out survey, with Ens. Forrest, of the Cavery R. to W. of Island of Seringham, down to the anicut, "that no cause of complaint between the Nabob & the Rajah of Tanjore may remain unexplained" [95 n. 8][11].

When submitting this survey "with particular Revenue notes", in June 1788, he applied to succeed Pringle "in the Direction of the Guides. His having been regularly bred a surveyor, and having risen by succession to the appointment of Surveyor General to the Ceded Islands, leaves his experience in that line undoubted"[12].

CADOGAN, The Hon. George. Mad. Civ.
b. 1–1–54. d. 1780, S. India.

Writer, 1771. Junior Merch. 1780.

4th son of the Hon. Charles Sloane Cadogan, afterwards 1st Earl Cadogan of Caversham, Oxfordshire.

Lodge's *Peerage*, 1803.

1775, "To survey the Island of Devicottah, and lands dependant on Cuddalore" [143].

CALDWELL, Arthur. Ben. Engrs.
d. 26–1–86.

m., Elizabeth —, who with her two children was admitted to Lord Clive's pension fund 22–8–87. Father of James Lilliman Caldwell [*inf.*].

1778, Survd. route of Ben. Dett. under Leslie and Goddard, Kālpi to Burhānpur [4, 39, 155]; maps beautifully drawn.

2–8–79, Appd. Fd. Engr. to Goddard's army.

CALDWELL, James. Ben. Engrs.

Lieut. 4–9–81; Resd. 1793.

Hodson.

1787–88, Survd., with Ens. Rickarts as asst., the Banka N, with estimate of cost of making it navigable. 1788, Corrected Lacam's survey of Channel Creek and harbours on Hooghly R. [51].

Dec. 1789, "in hospital for insane persons, ... not capable of attending to any business"; 1793, Struck off the strength on account of lunacy, and sent to Europe; 24–12–1803, Directors decline to reinstate him in spite of restoration of health, pleading lapse of time, but continue allowance of £ 90 a year from Contingent Fund[13].

CALDWELL, James Lilliman. Mad. Engrs.
b. 1770. d. 28–6–1863.

Ens. 22–7–89 ... Left India 1837; Gen. 20–6–1854. C B. 4–6–15; KCB. 1837; GCB. 1848.

Son of Arthur Caldwell, Ben. Engrs. [*sup.*].

m., Madras, 18–2–94, Jeanne Baptiste, dau. of M. Maillard, of Dole, near Dijon, widow of Richard Johnston, an officer of the Guards.

DNB.; *DIB.*; Vibart, II, with portrait.

After survey in Bāramahāl [273] was, 26–3–93, appd. Asst. Survr. under Topping on survey of Kistna and Godāvari deltas [106]; Aug. 1793, cannot be spared for service at Pondicherry; Survd. coast from Masulipatam N. wards for 106 miles [105]; and also several miles of the Godāvari, with levels [7, 106–7, 193–3]; 1796–7, completed Topping's [qv.] drainage of Masulipatam, reporting that "the putrid strench...is now no longer felt".

1795, Report on project for irrigation of Devicottai; from 1797, Supt. of Tank Repairs under Rev. Bd. [108–9].

4th. Mysore War, wounded at assault of Seringapatam, 6–5–99.

M G O. 11–8–1810, Appd. Senior Engr. & Survr. on expn. for capture of Mauritius "without prejudice to his situation as Superintending Engineer at the Presidency".

1–10–1813, resumed appt. as Inspector of Tank Repairs. Jan. 1816, acted as CE. Madras; designed St. Thomas' Cathedral, afterwards constructed by De Havilland [qv].

"Painted in water colours with great skill" (*DIB.*).

[1] Name also spelt Byers. [2] CD to M. 2–2–81. (11). [3] I O. Logs. *Deptford*. [4] Vibart. [5] in 3° 30′ N; 46° E. [6] 66 D/2. [7] Wylly (284–5). [8] Mack. MSS. LXVIII, 15–9–84. [9] Map. MRIO. 150 (25), Mack. MSS. LXVIII, 7–4–84. [10] Fullarton (231). [11] Mack. MSS. LXIX, 15–5–87, & 23–9–87. [12] *ib.* 9–6–88, & DDn. 246 (62). [13] I O. Misc. 43 (355).

CALL, James. Mad. Civ.
d. 8–7–99, Madras.

Writer, 1766 ... Senior Merch. 1778.

Bro. to John Call [*inf.*].

15–7–65, Arrd. Mad., appd. Pract. Engr. & Ens.; tr. to civil thro' influence of his bro. John[1].

Not a surveyor.

CALL, Jewel. Mad. Civ.
bapt. 4–9–48. d. 17–3–83, Poonamallee.

Writer, 1771 ... Senior Merch. 1782.

Bro. to John Call [*inf.*]; left all his property to his bro. James [*sup.*].

22–8–71, Arrd. Madras; 12–2–73, Appd. to assist Barnard "in the drawing and writing business" required to complete the survey of the *Jāgīr* [142].

CALL, John.[2] Mad. Engrs. & Civ.
b. 30–6–32. d. 1–3–1801.

Ens. 1–1–51 ... BtCol. 10–4–65.

Writer, Jan. 1751 ... Member of Council, 8–9–60[3]; Ret. 8–2–70.

Son of John & Jane Call, of Prestacutt, Launcells, Cornwall, and bro. to James & Jewell [*sup.*]; 1st cousin to Thomas [*inf.*]. Ed. Tiverton & Somerton.

m., 28–3–72, Philadelphia, dau. of Wm. Battie, M D.

F R S.; High Sheriff of Cornwall, 1771; M P. for Callington, Cornwall, 1784–96; cr. Bart. of Whiteford, Cornwall 28–7–91.

DNB.; DIB.; Holzman (136).

Arrd. with Robins [311] in Bengal 14–7–50 for work on Ft. William; to Ft. St. David, 1751, In several military campaigns in S. India up to 1760, making various plans and surveys [3, 87, 98, 271].

On formation of corps of Mad. Engrs., Jan. 1759 [271], appd. Sub-Director & Capt. at head of corps, to date from 1–1–57 [272]. Promoted Engr.-in-Chief 31–7–60 and CE. 31–7–61.

Valuable engr. services during defence of Madras, 12–12–58 to 17–2–59[4]; his journal of the siege is pub. in Cambridge's History[5], also long letter to Clive, 1–9–58, describing capture of Ft. St. David by the French[6].

15–7–60, described operations against the French settlements, Kārikāl & Pondicherry, in which he comdd. 50 Pioneers; "Ten sheets bearing the Delineation of our Conquests go on this Ship, and I suppose will be published; at least I think they ought, that the Commander may reap all the Honor he deserves from such successes"[7].

Sent the Directors "a very sensible account of the method he practises to make Powder"[8].

Sept. 1763, Comdd. Engrs. at siege of Madura, where he had a fall from his horse and broke an arm, but remained on duty.

Only one map has been found which is definitely known to have been survd. by him; "A Sketch of country from Vellore to Pass of Cuddapahnattam, taken in April 1763"; sd. J. Call[9].

Another map which may contain his work is a "Plan of the march of the English Army under Caillaud from Nellore [16–2–62], to Arni [1–5–62]"; shows coast line, and lines of march with each stage; very neat, especially the handprinting[10].

1766 and 1767, Sent a number of maps of S. India to Clive and Palk [87n.9], to be delivered to Orme, to whose *History* many of them are appended, sd. by Call as CE., tho' few of them are likely to have been survd., or even compiled, by him. [153, 211, 239].

On the death of his father in 1766 Call expressed a wish to leave India, but the Council desired him "to remain, on account of his long experience and Abilities in Military affairs, as well as those of the Country, ... constant readiness to give his assistance, a zealous attachment to the Company's true interest, and a vigilant attention to the Prosperity of their Affairs. ... Mr. Call replied that his whole aim has been to serve with credit to himself, and with the Approbation of his Hon'ble Employers. ... He very readily lays aside his intentions of leaving India"[11].

1767, Sent on a secret mission to interview "the Mahratta Chief", to arrange an alliance with him at the time of the war against Haidar Ali[12]. The following year Call and another Member of Council accompanied the army operating in Mysore, as Field Deputies representing the Council[13].

1769, when officers of the Engr. Corps. were called on to choose between service in the Corps or the Civil [272], Call was specially exempted, and allowed to hold his position in both. At the end of that year, however, he applied to return to England on account of ill-health, and on 25–1–70 obtained permission "to embark with his European Servant on board the Britannia, and bade farewell to the Council", sailing 8–2–70.

During his long service in India, Call had accumulated a substantial fortune; amongst other interests dealing in diamonds, and sending them home to his father through Palk [*v.* Motte][14].

Many of his personal letters are preserved, with several to and from Clive; the following are extracts from some of them;

Aug. 1759, "Money I hope soon to have enough; the next thing I want is honour, and unless I can have it here with my right, I am determined to seek it in Europe"[15].

On 3–5–61, after describing various marriages and engagements in Madras, he adds, "If you should hear any such reports of me, do not believe it, for tho' my inclination leads that way, Duty and Interest forbid the Banns"[16].

Again, in a letter to Richd. Smith, "I can now say I am worth £ 25,000, and that, my friend, is the amount of my Fortune; and I am sure I can live on the income of it in my Country like a Prince. ... My affairs are reduced all to money, & that is with the Nabob at 25% per annum"[17].

After retirement Call cherished the ambition of becoming Governor, and in 1779 applied to return to civil duty; on Sir Thomas Rumboldt's retirement in 1780, he was considered to be first rival to Lord Macartney for the succession[18].

He was always regarded as an authority on Madras affairs, and in 1775 submitted to the Directors a memorandum, starting, "Having spent more than 20 years of my life in the service of the EIC., and participated of almost every Employ in the Civil & Military Line on the Coast of Choromandel, and being now a standing and independent Proprietor of East India Stock, ... gave me not only a most intimate Local Knowledge of every District, ... but a distinct and clear Idea of all the Political & Military Transactions...from December 1750 to 1770"[19].

Besides a London house in Old Burlington St., he bought Whiteford, Stoke Climsland, in Cornwall, "which he converted into a handsome seat".

In 1786, Joined John Pybus (Mad. Civ.) in founding a bank in Bond St., besides engaging in other business interests [217 n. 1].

After 7 years of blindness he died in London of an apoplectic fit.

[1] CD to M. 4–3–67 (53). [2] Wrongly stated to have succeeded Rennell as SG.; confused for his consin Thomas. Markham (55). [3] Vibart, I (49). [4] Orme; Grose, II (299). [5] Cambridge (155, 156). [6] HMS. 808 (127). [7] ib. (185) 3–5–61. [8] CD to B. 9–3–63. [9] Orme MSS. 333 (16). [10] BM. Addl. MSS. 15739 (11). [11] MPC. 19–9–66. [12] M to CD. 15–4–67 (8). [13] Vibart, I (104). [14] Palk MSS. (35) [15] Orme MSS. 26 (16). [16] HMS. 808 (185). [17] Holtzman (27); At this time many Mad. Servants accumulated large fortunes which they lent to the Nawāb of the Carnatic, whose indebtedness in this way led to much trouble. [18] Love, III (219). Governors; Rumbold, 1778–80. Macartney, 1780–6; Campbell, 1786–9. [19] HMS. 136 (785) & Vol. 772.

CALL, Thomas. Ben. Engrs.
b. *c.* 1749. d. 12–12–88, at sea.

Ens. 15–9–71 ... Lt Col. 13–2–86; Resd. 15–11–88.
SG. Bengal, 1777–86 [260 n. 2].

Younger son of Richd. & Mary Call, of Prestacutt, Launcells, Cornwall; 1st Cousin of John Call [*sup.*].

m., Calcutta, 5–2–84, Bethia, dau. of John Blackburne of Sneaton, Yorkshire. Father of Thomas Henry Call, b. 1–11–84.

M I. Exeter Cathedral.

Hodson.

Nominated in England, 6–2–71, Pract. Engr. Bengal, and directed to call at Ft. St. George to assist in finishing the survey of the *jāgīr*; as this was almost completed by the time of his arrival, he proceeded direct to Bengal [1].

1773–4, Survd. roads in "Culna, ... Munboom & Burraboom, & Western parts of Bengal" [225]; Survd. a line nearly N. & S., to the west of Plassey; given an escort of 2 companies of sepoys from Midnapore[2] and attacked by local people [294-5], withdrew from Midnapore survey on account of fever [33, 35].

1776, received the following letter from his cousin John Call, Great Russell St., March 21st, "A few days ago, thro' the information of Major Watson who is to be your next Chief Engineer, I learnt that the Court of Directors had appointed a Lieut. Douglas [334] into the Corps of Engineers, to rank just above you. ... Upon this I took the alarm, went to the House, and traced the whole affair through the Committee of Correspondence, and made very strong representations of the injustice done. General Smith [24 n. 9] backed me, and went to the House on purpose. ... I wrote a letter to the Chairman the moment I was certain on the fact, but being yesterday at the Court, and having an opportunity to urge my complaint in person, I added that I asked no favor, I only contended for justice, which they ought to give unsolicited. They acknowledged they had done wrong and would rectify it"[3].

Appd. SG. in succession to Rennell from Oct. 7th 1777[4] [37, 260], having been recently employed in constructing Barracks and defences at Chunār. Built a block of Invalid Barracks at Ft. William in 1782, and had to rebuild the roof three years later "as it admitted the rain very much".

26–3–81. Produced a theatrical entertainment in Calcutta, *Venice Preserved*[5].

1783, reported that he had in hand an Atlas of India [3, 5, 11, 12, 38, 215–7, 286], and that

"The application necessary to such a work, in a climate such as this, has much impaired my Health, and the General of the faculty have recommended me strongly to take a trip to Europe. ...

"Being on board a ship I shall be able to pursue my business with more expedition than I could do if I remained in India, both on account of the benefit which I expect to derive from the change of climate, as well as retirement. ... I shall be as fully entitled to my allowances as if I remained in India; it will not be expected that I should labour six or eight hours a day during my passage for nothing; if the work be of Public utility it merits a recompense. ... I am very anxious to see it appear before my Hon'ble Masters at home, from a conviction that it will meet their approbation and encouragement, and further that I shall ultimately be rewarded by a regular succession to the command of the Corps"[6].

The Council were prepared to recommend this to the Directors, and Call further asked, 14–10–83, that it might be represented that, "In going home, though actually employed in the execution of my duty, I shall be under the necessity of resigning the service; this I consider to be a hard case, but by the custom of the service, and the absolute orders of the Court of Directors, it appears that no alternative can be admitted of. ... I beg leave to request that you will be pleased to issue an order expressing the nature of the service I am sent home on, to secure not only my return with my rank, but the continuation of my appointment"[7].

As his request for advance of eight or ten months allowances was refused, Call abandoned this visit home, and continued working on his map [215, 253, 257].

Feb. 1786, the office of CE. falling vacant, Call resd. that of SG. to become CE., being promoted to Lt.-Col. at the same time [43, 157, 216, 260].

As a reminder that more than 150 years have passed since Call was in Calcutta, we may note that in *CG.* of July 17th 1786 he advertised for "a runaway slave called Jack". Such advs. were common, the slaves being generally negros.

1788, Call asked leave to resign, writing on Oct. 13th, "Having for near two years past labor'd under a severe and dangerous illness which neither care or medicine can get the better of, I am by the advice of the most skillful of the faculty reduced to the painful necessity of soliciting your Lordship's permission to resign the service, and to go to England for the recovery of my Health. ...

"Holding a distinguished appointment, ... lately appointed to it, limited in point of fortune, and having a young family, nothing could induce me to pursue this measure but the most urgent necessity, and as the only means left for saving my life.

"Should I be so happy as to reach England, and recover my Health, it is my intention to solicit...to be allowed to return with my Rank...and to succeed to my present appointment in the first vacancy"[8].

16–11–88, Sailed from Calcutta, taking with him a copy of his Atlas to present in person to the Directors [216–7][9]. In less than a month he died, some where in the Indian Ocean, and it was not until the following August that the news reached Calcutta.

CG., 30–10–88, Adv.; "Public auction at Col. Call's Quarters at the New Fort. The effects of Col. Call previous to his departure for Europe.

Plate	A European Built Chariot.
Furniture	A Phaeton.
Books	2 pairs of Excellent Carriage Horses,

also Col. Call's Garden House to be sold, situated close on the Banks of the River below the Fort, with 70 Biggahs of Land".

He made his will just before sailing whilst "enjoying a tolerable state of health, and perfect contentment of mind," leaving to my affectionate and Tender wife, Bethia Call, £15 thousand. ... To my mother Mary Call at Kentan near Exeter in Devonshire...; To my sister, ...; to my Brother Richard Call...; To my natural daughter, Sally Preston, now

[1] M to CD. 28–2–72 (18). [2] *Midnapore Dist. R.*, 15 & 29–3–74. [3] BPC. 30–10–76; Douglas [qv.] reverted to Inf. [4] CD to B. 27–5–79. [5] Fay (153). [6] BPC. 6–10–83 (21). [7] BPC. 20–10–83 (28). [8] BPC. from Call, 13–10–88. [9] cf. Reynolds [219].

living with my dear sister Sarah Terrell, £ 4,000 ; ... To my dear friend John Call, of Whiteford in Cornwall...& To Francis Wilford, to purchase rings.

"Residue of my fortune to my three legitimate children, Thomas Henry Call, Maria Call, and Eliza Call ; ... my son Thomas Henry Call should be brought up at the Bar "[1].

CAMAC, Jacob. Ben. Inf.

b. 1745. d. 1784, of a fever in Ireland .

Tr. from H M's 84th Regt. of Foot in 1763.
Lieut. 14–10–63 ... Lt Col. 3–2–81 ; Resd. 2–12–82.

Son of John Camac, of Rose Hall, co. Downe, Ireland, and Elizabeth Turner his wife.

DIB. ; EIMC. II (101).

From 1766, Comdg. 24th Ben. Batt., Rāmgarh frontier ; 1770, comdg. forces which subdued districts of Rāmgarh, Palamau, & Chota Nāgpur, with political charge of this area [30, 225, 294].

Dec. 1778, Appd. to comd. force supporting Goddard's march on the western frontiers ; Dec. 1780, took comd. of Popham's force after capture of Gwalior, drew Sindhia from Guzerāt and defeated him at Mahatpur near Sironj, 24–3–81 [40, 315].[2]

When submitting maps in 1774, Rennell acknowledged sketches made by Camac "'in the little known regions of Ramghur and Palamau' [35,000,000], and later acknowledged" some very useful Routes and other Geographical materials, communicated by Col. Camac...[who] to his praise, employed a part of his leisure time, during his command on the Western Frontier, in enquiries concerning the State of Politics, Government, Geography, and nature of the countries... which has till now been very little known to us"[3] [30,286] v. Cameron, W.N. [325].

CAMERON, Hugh. Bom. Art.

d. 16–3–64, in 24-Parganas, Bengal, of dysentery.

Ens. 3rd Co. of Bom. Inf. 1738 ; Lieut. Dec. 1746 ; Master Gunner, Bom. Art. Sept. 1748 ; Capt. & CE. Art. 4–4–49 ; tr. to Inf. Oct. 1750 ; Resd. 1–10–58, but declared a deserter.

Son of Margaret Cameron of Aire, near Glascow.

m., Bombay, 22–7–50, Miss Elizabeth Johnson.

Dec. 1754, comdg. force which occupied Bānkot, or Fort Victoria[4], from Bombay.

Early 1758, sent to Tellicherry, on Malabar Coast, where fortifications had been proposed, but "was Divested of his command over the Military the 7th May ; he was however paid to the end of August, though he had often absented himself without leave of the Chief of Tellicherry. On the 28th September He and his Family set out for Durmapatam, and on the 1st ult. he sent the Tellicherry servants his commission and a letter from Cannanore"[5].

"Till Capt. Hugh Cameron became 1st Officer [at Tellicherry], the Military behaved properly. ... Capt. Cameron has been offered a passage hither [Bombay], therefore t'is thought he has no Intention of Quitting Cannanore"[6].

Cameron himself wrote, 12–10–58, explaining that the Chief at Tellicherry had on 7–5–58 directed him to hand over his charge and return to Bombay "by the first conveyance" ; that this was "almost six months before there was even a possibility of proceeding [303] ; and for all this not any reason assigned, no Crime alledged ; nor at any time had I ever been charged with any misconduct, incapacity, or neglect of duty during a Service of two and twenty years".

Finding it impossible to secure a passage to Bombay, even by hiring a country boat, "(the Season of the year, often fatal to small vessels, deterring some, and the length of the voyage frightenning all I laid aside all thoughts of being able to proceed now, and determined to wait a more favourable opportunity". He had moved to Cannanore in the hope of finding a passage, and "as...I believed that my not proceeding...might be considered as an act of disobedience, ... I thought it advisable to resign the Hon'ble Company's Service and my Commission...with a letter the 1st inst." ...

When this "was read in Council, the Governor[7] declared I had deserted the Service ; but a Majority opposing this Sentence begged he would change that odious appellation for a milder word, and directed the Secretary to call it *absconded.* But the Governor in wrath took the minutes himself, dashed out that word, and wrote *Deserted* with his own hand. ... In consequence of this he caused me to be proclaimed a deserter at the head of the Troops, and wrote to...apprehend me as such and send me to Bombay a prisoner. ... How hard this ! ... to be forced into exile for about two years. ... Just about this time too [before submitting resignation] I received warning, even from some of the Council at Bombay, ... by no means to put myself in Mr. Bourchier's power, as he was fully bent on my distruction. ... All intercourse with my friends at home or abroad he cut off. All letters were intercepted, and either kept or copied as they fell into his hands. ... Letters from Europe, even those to my Wife, were broke open, and when sent, sent so, some with the Seals shattered, and some without any seal at all. ...

"Could it be for my ill behaviour that I was presented with two Commissions together at the head of the Troops ? One as first Captain of the Train of Artillery : the other as Captain of grenadiers, and held both...until the latter was incorporated...with the other Companies of the Regiment. ... Could it be the reward of ill behaviour to have the first Commission that ever was issued for Chief Engineer given me ? ... I was clerk of the works for Sixteen or Seventeen years, and I made gun Powder for the Company"[8].

Cameron is next heard of in 1761, when the Bengal Council report that he had been appd. to survey "the New Lands [24-Pargannas]", and two years later they write to the Directors, "Neither can we in justice omit recommending to your particular favour and countenance, Mr. Cameron, who has, for these two years past been employed in the Office of Surveyor at this Presidency. In this capacity he has been engaged in making a Survey of your Lands in the Calcutta Purgunnas, and has in part executed the same with care and exactness, much pains & Trouble [2, 13, 51, 136, 269]. ... And as we are well assured of this Gentleman's abilitys and Knowledge in the Engineering and Artillery Branches, we cannot but point him out as a person who may be very useful to the Company"[9].

The Directors had however already noticed the appointment, and wrote out "We observe...that you have entertained Mr. Hugh Cameron as Surveyor of New Lands; In the year 1758 or 1759 there was one Mr. Hugh Cameron, a Captain in our Service at Tellicherry where he behaved very ill, as he had done before at Bombay, and deserted our service, by going to Cannanore and not returning again to his duty. In case this is the same man, We direct that he be immediately dismissed Our service, and sent home by the same ship"[10].

[1] Ben. Wills. 1787–90 (31). [2] *Late War in Asia* (290); & Grier (iii). [3] *Memoir*, 1793 (238). [4] 47 G/1. [5] Bo to CD. 7–11–58 (107). [6] Bo to CD. 27–3–59 (165–6). Progs. of Bom. Govt. approved by CD to Bo. 25–4–60 (134). [7] Richard Bourchier. [8] Given contract for gunpowder June 1747 ; Young (70). BPC. 8–8–63, with Cameron's letters of 12–10–58 and 29–7–63. [9] B to CD. 14–2–63 (37). [10] CD to B. 17–12–62 (53).

To which the Council replied, "Mr. Hugh Cameron ...is the same person who was formerly in your Military Service on the Bombay Establishment. Upon our giving him notice of your displeasure, and orders for his dismission, he requested that he might have leave to represent his case[1], which he never before had an opportunity of doing. ... As we are well satisfied with his Behaviour since He has been here, and have found his Services very usefull, and greatly tending to the Improvement of the Revenues of your new Lands, We have presumed to suspend the Execution of your orders, and to keep him in the same usefull Employment untill we receive your further Determination [51, 136][2].

The Court's reply was favourable, "In consideration only of your strong recommendations of Mr. Cameron for his usefulness to our Service, We permit you to continue to employ him so long as it may be found necessary"[3], but long before this reached Bengal Cameron's service had ended, and the Council reported in November 1764, "We are to mention the death of Mr. Hugh Cameron, the 16th March last, of a Dysentery; in him you have lost a very useful servant[4].

Cameron left his property divided between his widow, his "lawful begotten son John", and Hugh Johnson; "I have a right and Title to 3 Houses in the town of Aire", which he bequeathed to his mother[5].

In January 1765 his widow applied to the Council "on account of the services rendered the Company by her late husband, whose death was, she represented, partly owing to the unwholesome air and Damps he met with in his survey of the New Lands, that we will grant her a monthly pension. ...

"Agreed...that his death was in a great measure brought on him by the circumstances she represents, that we grant her the usual monthly allowances made to the Widows of Captains deceased in the Company's Service"[6]. She appears to have died in Calcutta [bur. 20–3–82], leaving a little more than Rs. 2,000[7].

Cameron's survey was made use of by Rennell, and is still preserved in Calcutta [13, 250 n. 5]. He was the first officer to receive the regular appointment of Surveyor anywhere in India, and was immediately succeeded by Rennell [269].

CAMERON, John. Ben. Engrs.
d. 5–6–76, at Ft. William.

Ens. 10–4–64 ... Lieut. 21–3–65.

Hodson.

Dec. 1764, John Cameron, "Ensign & Draughtsman", sd. petition from officers of the corps of Engrs. regarding their grievances.

April 1767, on survey in Rāmgarh [26, 270].

CAMERON, William Nevil. Ben. Engrs.
b. 1755. d. 13–5–1837, Bath.

Ens. 8–5–75 ... Ret. 1804; Lt.Gen. 25–4–1808.

Son of Rev. Wm. Cameron and Judith his wife.

m., Calcutta, 17–8–89, Charlotte, 2nd. dau. of Sir Wm. Gordon, Bart., of Embo.

EIMC. I (50); Hodson.

Arrd. Bengal as cadet, and as such employed as Asst. Engr. at Buxar, and with Select Picket during Rohilla War of 1774 [266].

About 1775–6, Appd. Depy. to Fd. Engr. on active service in Oudh. 1778, Appd. Survr. with Camac's force supporting Goddard's march to Surat [40, 324]. 1780, Fd. Engr. with Popham's force, planning the assault, and fixing scaling ladders, at capture of Gwalior [315].

"Sketch of the Ranah of Gohud's Country, 1780", and "Route of Detachment under Camac, 1781", preserved at British Museum [40].

23–2–93, succeeded as CE. Ft. William, holding the post till 1800.

CAMPBELL, William. Ben. Inf.
b. *c.* 1742; d. between 30–1–79 & 29–6–79, in W. India.

Ens. 14–9–65 ... Capt. 22–9–70.

Owned estate of Ballinbar in Islay, co. Argyll.

Will sd. 26–6–78; cod. sd. "Brampore"[8], 30–1–79, and witnessed by John Campbell[9] & W. Ross Munro, with bequest to his son James Gowan Campbell[10].

Hodson; *Clan Campbell* No. 230.

Survd. coast from Puri to Ganjam, the Chilka Lake, and "the road from thence to Balasore, through Cuttack[11]" [28, 199].

BPC. 2–6–77 (6), Comdt. at Budge Budge.

1778, with Elliot's[12] ill-fated mission, Cuttack to Nāgpur, and probable author of journal & survey of the route [39].

Farquhar[13] reported, about 2 coss east of Sarangur[14], 9–9–78, that Elliot was "seized with a severe Bilious disorder, attended with an inflammation of the Liver. ... Capt. Campbell, our other fellow traveller, is also very ill of a complaint much of the same nature "[15], and again, 30–9–78, "Capt. Campbell had a return of his disorder".

Elliot & Farquhar both died, and Campbell and Anderson moved on to Ratanpur, Campbell writing from there to Warren Hastings, 19–10–78;

"I hope you have long since received Mr. Farquhar's report of Mr. Elliot's Death on the 12th Sept. I was at that time so dangerously ill that I could not advise you of that unfortunate event, which was immediately succeeded by a sickness throughout the whole party, ... as well as Messrs. Anderson, Farquhar and myself, all whom were so dangerously ill at the same time of a Billious Fever, that [we] could not afford each other the least help.

"Mr. Farquhar soon recovered of this disorder, but I am concerned to acquaint you that on the 7th inst. he was taken suddenly ill ten miles from this place, and continued delirious, a few intermissions excepted, till the 15th when he died.

"These circumstances, together with the badness of the Season & Roads, retarded so much the progress of our journey that we have come but about a hundred & ten or twenty miles since the 3rd of Septr. that Mr. Elliot & myself were first taken ill. ...

"I date this at Rajah Bimajee's Capital residence; he sent guides some distance to meet us, who persisted in bringing us out of the right road to come this way, notwithstanding Mr. Anderson & myself was at that time very ill; ... but we are to think the less of this delay...for he has received us with extraordinary politeness, vast state & ceremony; ... the day after [tomorrow] I am in hopes he will permit us to depart, and as the Rains are just broke up & every body on the recovery, I have no doubt but we shall be at Naugpore by the 5th Novr. ...

[1] *v.* letter of 29–7–63 [324]. [2] B to CD. 19–12–63 (94). [3] CD to B. 15–2–65 (76). [4] B to CD. 26–11–64 [*v.* Rennell]. [5] Ben. Wills, 154–52 (9). [6] BPC. 14–1–65. [7] Ben. Let. of Admn. 1782, 11–4–82. [8] Obviously Burhānpur (*inf.*). [9] Hodson gives two John Campbell's who served with Goddard's force. [10] Wrongly given as son to John Campbell in some places. [11] *Memoir*, 1783 (22, 68). [12] Elliot & Bogle were close friends, & both favourites of Warren Hastings (Clements Markham). [13] A Robert Farquhar served as juror at inquest on Lord Pigot, Madras, 1777. Under BSC. 20–7–78 (14), drew whilst on Elliot's mission "Pay & Double Batta of a Captain", and shewn in index under "Company's Servants". [14] 64 O/2. [15] BSC. 28–9–78.

'P.S. I request you will be kind enough to excuse the badness of this scrole, not having yet recovered the strength of my nerves" [1].

Anderson wrote a similar letter [2], and reported later that the party had reached Nāgpur November 15th, and according to the journal [3] Campbell appears to have reached Goddard's camp at Hoshangābād, 21–12–78, and with that force would have reached Burhānpur 30–1–79 [121], obviously extremely ill, for he sd. his cod. that very day [39].

His death, of which no record has been found, must have occurred between this date and the middle of June, his will being filed in Calcutta, 29–6–79.

CARTER, Thomas. Ben. Inf.
d. 5–9–76, at Bilgram, Hardoi Dist., Oudh.

Ens. 13–8–65 ... Capt. 19–5–70.

Hodson.

On 8–9–66 Clive wrote to Lady Clive, "Your relation Mr. Carter is a most deserving Young man [269]. I gave him a Commission immediately upon his Arrival, and the General has since made him his Brigade Major" [4].

Two weeks later the Sel. Com. ordered the C-in-C. to send him from Monghyr to assist in the survey of the western passes [25], and on Rennell's appt. as SG., 1–1–67, Carter was placed under his orders [31].

April 1767, on survey along the Ramgarh-Midnapore Frontier, in company with John Cameron and Russell [26,270]. Carter's opinion about the line of this boundary met with a protest from Ferguson [28], who found his movements disputed because "Lt. Carter happened to come that way in the course of his survey, as if the Chief of Midnapore was not a more proper judge of the limits of his own province, than a young gentleman about a year in the country who is ordered on a survey, I suppose, because he knows the use of Gunter's chain and the Theodolite, and is perhaps an excellent hand at Charts" [5].

Continued survey in Midnapore, from where it was reported, 29–1–70, that "Mr. Carter is arrived here yesterday and proposes to set out for Balasore in 3 or 4 days [138 n. 3, 152]. Three months later he was at Ghātsila [300].

1771, Survg. through the "Harboe District" of the present Santāl Parganas, where his escort had to be strengthened for protection against the "Chuars" [300]. Arriving Bhāgalpur, he then worked into Rāmgarh [294], still drawing his expenses from the Chief at Midnapore, who wrote to him, Feb. 1772;

"I had the pleasure to receive your letter of 6th, and very readily admit your apology for your silence, tho' I could wish to have had a more favorable account of your health. ... I heartily wish you health and success" [6].

It is not known when he made his survey of the "Routes from Benares to Corah, via Fyzābād, and to Chatarpur via Rewah", which is referred to by Rennell and still preserved in Calcutta [30] [7].

Sept. 1775, Obsd. lat. of Benares in company with William Smith [154], being probably on duty with his batt., as all survrs. had been recalled the year before.

More than 30 years later the SG. sent to the QMG. "my best thanks for the very valuable geographical sketch [of Chota Nāgpur] by Captain Carter which you have sent me" [8].

Carter was one of Rennell's most valuable assts. and his surveys covered the greater part of SW. Bengal, from Bhāgalpur to Balasore [32, 33, 225].

COLEBROOKE, Robert Hyde. Ben. Inf.
b. 1762–3, in Switzerland. d. 21–9–1808, Bhāgalpur, Bihār.

Lieut. 9–11–78 ... Lt.Col. 2–11–1803; SG. Bengal, 1794–1808 [260 n. 2].

Hodson.

Natural son of Robert Colebrooke, of Chilham Castle, Kent, H M.'s Minister to the Swiss Cantons 1762–4, Ambassador to Turkey from 1765.

Robert Hyde's grandfather, James Colebrooke, mercer of London, bought Chilham Castle, Kent, 1724, and d. 1754; he left 3 sons, of whom the eldest, Robert, was M P. for Malden and became the 1st Bart.; the 2nd son, George, became a Director of the EIC. and succeeded as Bart.; George's eldest son, Henry Thomas, Ben. Civ., wrote papers on the *Height of the Himalaya Mountains* [77].

Robert Colebrooke m., 1st, 1741, Henrietta Powlett, who dsp. 1753; 1756, m., 2nd, Elizabeth Thresher, then only 19 years of age. There were no children of this marriage either, and apparently they did not live together after Robert's departure to Switzerland, from which time he lived with Mary Jones, née Williams, wife of Robert Jones. By this connection he had a natural family of 5 sons and 1 daughter, of whom the eldest was our Robert Hyde, Ben. Inf., followed by James, Mad. Inf., [111], and John, Mad. Cav.

Robert sold Chilham Castle in 1774, having to obtain Act of Parliament [9] to break the entail, in order to assign estates to trustees as provision for his wife Elizabeth, and to meet creditors.

He continued to live with Mary Jones on the continent, and settled at Soissons in France, where he d. 10–5–84. In his will [10] he desired "to be buried at Chilham Castle, in the Mausoleum built by me and my brothers...at the right hand of my late wife the Hon. Henrietta Colebrooke". An account of this mausoleum is given in the *Topographer* of Feb. 1791; it was demolished when the church was restored in 1863.

Our Robert Hyde had a natural son, Thomas, b. 21–12–94, and ed. in England [11]. 31–7–95, he m. in Calcutta, Miss Charlotte Bristowe, who d. at Bath 2–7–1833. Charlotte's sister Mary m. J. T. Blunt the following year [313]. Colebrooke's 1st dau. was bapt. 2–10–96; his 3rd dau. had a double christening with Blunt's 2nd; and they gave their first-born sons a double christening on 9–2–1801, each with the name of Richard [12].

Young Richard Colebrooke was b., Calcutta, 30–12–1800, and comnd. as Ens., Ben. Inf., 1–8–1818, ret. 13–8–1831, and d. 23–2–1868.

Robert Hyde arrd. India 10–12–78, having obviously obtained cadetship through his uncle George. The first we hear of him in India is that he was granted leave from Madras to Bengal, Oct. 1782, on account of ill-health [13]; he had marched down the East Coast, 1781, with Pearse's dett. [41].

15–11–83, before the return march to Bengal, Pearse appd. him Survr. to the Dett., and, shortly after, his 2nd A D C.; Pearse says that "when Lieut. Colebrooke entered upon his office, he was not acquainted with the astronomical part; he however very rapidly acquired it, by means of the instructions

[1] BPC. 16–11–78 (38). [2] ib. (39) & BM. Addl. MSS. 29141 (460). [3] MRIO. M. 272. & 320. [4] H MS. 819, (31). [5] *Midnapore Dist. R.* I. 5–4–67 (168). "Ghatseela Fort". [6] ib. IV. 14–2–72 (115). [7] *Memoir*, 1793 (206); MRIO. 29 (42). [8] DDn. 67 20–6–1806 (474). [9] House of Lords Library. [10] pr. 1784, Somerset House. [11] The Indian mother was left a pension of Rs. 50 a month, capital to revert to Thomas on her death. Will Sd. Lucknow, 24–12–1807. [12] Ben Eccl. 1801. [13] MMC. 3–10–82.

I gave him, and has, without any further aid from me, carried the survey on from the cantonments to this place [Gaurhāti] [1] [41, 270].

Colebrooke's survey exeeded 1124 miles, from Madras to the Hooghly, measured by perambulator the whole way, and checked at frequent intervals by astr. obsns. [4, 42, 60, 155, 199].

Whilst with his batt. up country during the next two years, he took every opportunity of making surveys, and one of these, preserved at Calcutta, "a sketch of the road from Chittra to Jelda," SW. of Parasnāth, bears a note "by Lt. R. H. Colebrooke when marching with a company in 1786. The distances were measured with a wheel of 7′ diameter, the same as he used in his other surveys [199]. ...This was done for his own private amusement" [2].

1787, with Kyd to Penang to survey the newly acquired island and its harbour. Sailing from Calcutta in April, they completed their survey, and in July went on to Kedah where they saw the King of Kedah, who had ceded Penang to the English on promise of protection against his enemies [3] [46].

Colebrooke kept most interesting journals of this trip, and also wrote an article *On Barren Island and its Volcano*[4]. Sailing from Kedah, they anchored next in Achin Roads [47], and were granted an audience of the King.

"We sat up till 11 and then waited impatiently till the King should send for us. The old Persian sat up with us, smoking tobacco through little reeds in the Malay fashion, entertaining us with the politics of Acheen. When we expressed our impatience at the lateness of the hour, he deliberately took the reed from his mouth, and said by way of comforting us, 'Don't you see that I am keeping you company?'

'At last about 1 o'clock the royal summons arrived. We put on our coats and swords and walked with our interpreter to the palace, which was about a mile from our lodging. The hall of audience had been illuminated for our reception, and as we approached had a cheerful appearance. ... We entered the hall after taking off shoes, which we were told was an indispensable mark of respect. The roof was supported by two rows of pillars and hung with a canopy of red cloth and blue damask. Glass lamps were suspended from the roof outside of the canopy and others were burning from the niches of the walls. The ground was spread with carpets, and some candles with glass shades were placed upon it. We were surprised to see nobody in the hall except the guards who were ranged on each side. The Persian who was walking up the hall with us in a supplicating posture with his hands joined, and the two ends of his thumbs touching his forehead, immediately whispered to us not to speak so loud. But the question being repeated, he ventured to direct our attention to a window which looked down from the upper appartments into the hall. There we met, not the *eye of love*, nor beheld with awe the glare of majesty, but perceived a little fat Malay grinning from behind a curtain which he held open with this right hand. This was the King"[5].

After staying six days at Achin, they sailed July 26th, and arrived back at Calcutta 12–8–87. Colebrooke stayed in Calcutta the next four months, and amongst other duties kept a journal of the weather, doubtless at Pearse's suggestion.

Leaving Calcutta by boat, Dec. 14th, he rejoined batt. up country, and his journal is of interest as showing the leisurely progress up stream [304].

1787, Dec. 17th. At Nuddea. ... Dec. 25th. At Moorshedabad. ... Dec. 31st. In the afternoon I left the Budgerow and pitched my tent about 3 miles from Mohungunge. I was unable to get by boats through the remaining part of the Baugratty on account of the shallows. ...

1788, Jan. 4th. In the afternoon I left Mohangunge in a patchy boat. ... Jan. 18th. In a tent at Mongheer. ... Jan. 30th. In a house at Bankypore. ... Feb. 23rd. Arrived Buxar... March 1st. Arrived Benares. ... March 4th. Arrived Chunar.

Whilst with his batt. Colebrooke took every opportunity of survg. its marches, visiting Benares, Jaunpur, Cawnpore, and other places [6].

Aug. 1788 the Directors sanctioned the appt. of a special asst. for charge of maps and charts [258]; "From the specimen which Lt. R. H. Colebrooke has afforded of his abilities in this Line, we think he should have the option of this employment". He was duly appd. and leaving Cawnpore by river, 24–3–89, arrd. Calcutta, June 10th; on the journey down he regularly obsd. lat. every evening and recorded everything of interest [7]; he took up his employment from July 7th being allowed to draw pay of the new post from Feb. 13th, the date of his acceptance [8] [237, 258 n. 7, 271].

Four mouths later he set out on another voyage with Kyd, now become SG.; this time they accompanied the naval squadron under Commodore Cornwallis [5, 48–9] on a cruise to the Andaman and Nicobar Is. [313].

They left Calcutta Nov. 29th. "and embarked on the board the yacht; 1789 Dec. 1st. Arrived on board the Atalanta sloop of War. 5th. Sailed from Saugor Roads at 10 a.m. in company with the Ariel, Crown, Phoenix, and Perseverance".

Colebrooke made daily obsns. for lat. and kept up his fascinating diary [48] [9];

"Dec. 13th. Coasted along the land at about 3 leagues distance. It appeared to be a wild Country, covered with wood. It has a steep and rocky shore. There were many rocks which seemed to be detached 2 or 3 miles from the beach. The most remarkable of these are called *The Buffaloes*.

"We passed Cape Negrais at about 1 p.m. This is the southern extremity of the coast of Ava. At about 2 the Commodore made a signal for anchoring and we came to shortly after, in about 5 fathoms, having Diamond Island about 4 miles to the Southward. The intention of stopping here was to catch turtle which are found in great plenty at this place. At night a party from the Ariel went on shore. They walked round the island in the dark and overturned 45 large green turtles which they found upon the beach. This is the usual manner of taking these animals, as they never appear on shore during the day. The next morning not above 25 were found, the rest having turned again and made their escape. This island is the most remarkable place in the Bay for turtle, and produces the species which is called *Green*, superior in size and flavour to any other.

"Dec. 14th. This morning I went on shore upon Diamond I. in company with Capt. Kyd and Capt. M— of the Ariel. We found the landing rather difficult on account of the rocks and stones which surround the island. Capts. Kyd and M. measured a base and took some angles with a theodolite to

[1] *Ben. P&P.* VI (281); Letter to GG., 29–1–85; also *As. R.* I. (115). [2] MRIO. 46 (11). cf. Charles Reynolds [122] DeHavilland [qv]. [3] Though Capt. Light's promise was promptly repudiated, the Company kept a firm hold on Penang. [4] *As. R.* IV. (397). [5] DDn. 48, Colebrooke's Journal. [6] Journals, DDn. 7, 9. [7] Fd. Bk. DDn. 7 M. 265. [8] BPC. 10–7–89. [9] Journal, DDn. 10.

ascertain the position of Cape Negrais and other headlands upon the coast. We observed the latitude of the island with our sextants. Mean 15° 49′ 38″. ...

"Dec. 19th. We have now caught altogether 102 large turtles in three days. This is an astonishing stock of fresh provisions for the squadron. Each turtle is sufficiently large for the consumption of our whole ship's company in a day, and we now have 125 men on board. ...

"Dec. 20th. ... We sailed from Diamond Island at about 11 o'clock".

The squadron then sailed down to the Andaman Is. and spent the last week of the year at Port Cornwallis, where Blair had established his headquarters. [313]. "Dec. 31st. Sailed from Port Cornwallis".

They then visited the Nicobars, and after surveying Nancowry and other harbours, returned to Port Cornwallis on Feb. 22nd. They sailed again 19–3–90; and explored the western shores of the islands in company with Blair. After frequent encounters with the islanders, some quite friendly and others the reverse, they took leave of Blair and sailed for Calcutta where they arrived 20–4–90 [49].

BMC. 9–12–90, Colebrooke was detailed for service in Mysore [237]; "The Governor General judging it probable that he may have occassion for your services on the Coast of Coromandel in your line of duty as Assistant to the Surveyor General, is pleased to direct that you proceed with all convenient expedition to join the Detachment of Bengal Troops that is now serving with the Army on that Coast"[1].

He did not this time repeat the weary march down the east coast, but got a passage by sea; William Hickey, the diarist, happened to be making a passage by the same ship, "for his health's sake", and tells of their meeting.

"On Christmas Eve...Capt. L.—[who had told Hickey he would never allow smoking in *his* ship] and myself...embarked in the pilot schooner...and reached the *Warren Hastings* the following afternoon. ... We found the whole of the Sepoys already on Board. Upon entering the Cuddy, we saw Captain Colebrooke and four other officers sitting at the table with hookahs in their mouths. Capt. L.—... deemed it better to let them continue than give offence by putting a stop to them. They therefore continued in the use of their hookahs during the voyage. ...

"We did not arrive until 11th January 1791—owing to light winds and calms [303] "[2].

Colebrooke lost no time in getting to work; his fdbk. records; "start from Fort St. George on Jan. 1st 1791; ... through Vellore on Feb. 13th; ... near Seringapatam May 27th; ... "; he survd. the route up from Madras into Mysore, and continued to survey all the marches of the army during campaigns of 1791 and 1792 [6–7, 112–3, 175, 187, 199, 237].

One of his fdbks. is embellished with full-page sketches and panoramas, tinted in watercolour, and including spirited sketches of Bangalore, Sevandroog, Nundidroog and other places[3] [187].

In Rennell's *Marches of the British Armies...1790–91* is included a "Plan of the Battle of Seringapatam, fought on May 15th 1791, by Lt. Colebrooke, Surveyor with the Bengal Detachment. The ground from actual survey and measurement"[4].

The following announcement is taken from the *CG.*, of 7–2–93; "We understand that Lieut. Colonel Brooke [*sic*] has finished, and will shortly present to Lord Cornwallis, a map of such parts of the Mysore Country as were traversed by the army under his Lordship's command during the campaigns of 1791 and 1792, in which the operations of the army and topography of that country are drawn upon a large scale, and with minute accuracy, the whole being the result of an actual survey, performed by Lieutenant Colebrooke while with the army.

"The map has taken Lt. Colebrooke five months in the execution, and is an additional proof of that gentleman's exertions and ingenuity [253, 277]".

Colebrooke now took steps to have some of his Mysore sketches engraved and pub., and several sets are still preserved. Whilst on service in Mysore he sent the following advs. to the papers.

CG. 9–2–92. "With the...permission of Earl Cornwallis, Lt. Colebrooke proposes to publish by subscription 12 views of the most remarkable Forts and Places in the Mysore Country, from drawings taken on the spot.

"He hopes by the time the Army will return from Seringapatam to have finished a select number of Drawings for this purpose, to be sent to England by the Earlist ships after that period, and to be engraved by the Best artists in Aqua Tinta. Subscription for each set 120 Arcot Rupees.

CG. 5–7–92. " Lt. Colebrooke having finished his views of the Mysore Country...asks subscribers to pay in their subscriptions to his bankers...,or to Capt. John Garstin at Patna. ... The drawings will be sent to England by the Dutton and be put in hands of the best Aqua Tinta Engravers. As this mode of engraving is more expeditious than any other, it is hoped that the prints will be struck off in Time to be sent out by one of the ships of next season. ... Plates 21 inches by 15 inches nearly "[5]. Then follows the list of views.

CG. 4–7–93. "*A Card.* Lieut. Colebrooke has the pleasure to acquaint the subscribers to his proposed publication of Mysore views that the drawings were received in England in December last. They were immediately put in the hands of Mr. Edy, an eminent engraver in Aqua Tinta, who was to execute them under the eye and superintendance of Mr. Paul Sandby; that on the 16th of January three of the plates were in great forwardness, and it was expected that six of the views would be ready for delivery in May. Mr. Edy had engaged to finish the whole set in one year".

In 1796 fifty sets of a second impression of these views were advertised to be sold by auction.

There are now two complete sets in the Victoria Memorial at Calcutta, besides "A water-colour drawing by R. H. Colebrooke, 1794, *A view taken from the big tree near the Jail* [Calcutta]. 22 inches by 12½"[6].

To each of the Mysore views was attached "concise descriptions of the places drawn, with a brief detail of part of the operations of the Army...and a few other particulars", and he is referred to as an authority in Roderick Mackenzie's history of the war;

[1] Colebrooke's accounts of this expn. and the islanders were pub. *A.R.* IV (129, 317, 385). [2] Hickey. IV (7, 493). [3] GBO. Lib. A.b. 86. [4] Rennell (114). [5] *Ft. St. George Gaz.* 5–6–92. [6] VM. Exbt. 935, 1609 & 2000–2009; see also folio at Imp. Lib.; "The Mysore War attracted more than one painter of Repute to the southern Presidency. Robert Home produced both protraits and landscapes, whilst Thomas Daniell, R.A. painted a well-known series of views in Madras, Mysore, and the Southern districts." Love (455).

"For such of these remarks [on Bangalore] as are not consistent with my own knowledge I am indebted to the researches of the ingenious Mr. Colebrooke; and as I know that his information is drawn from a source highly respectable, I entertain no doubt of its corrections. On this subject the reader is further referred to the explanation of that Gentleman's Views in Mysore[1].

At an entertainment at the Calcutta Theatre, 6-2-93, to celebrate the anniversary of the victory at Seringapatam, the scenery was painted from drawings by Colebrooke[2].

After his return from Mysore Colebrooke held charge of the SG.'s dept. till, on Kyd's resignation 7-2-94, he was appd. to succeed as SG. [43, 187–8, 237, 261, 268, 281–286].

One of his chief interests was the course of the Ganges and the water communications to Calcutta. 1794–5 he made three excursions to examine the channels leading from the Ganges, but his recommendations for improving communications into the Hooghly were never taken up [63–4, 274–5].

At the end of 1796 he made a three-months trip up the Ganges to record the changes that had taken place in its channel above the head of the Jalangi, and continued his survey up to Colgong. In an interesting memoir describing this survey[3] he wrote that he had seen the Ganges at Colgong in 1779, 1788, and again in Jan. 1797 [8, 64–5].

As was his invariable rule he took regular obsns. for latitude, and kept up his journal. 16-11-96, on his way up the river, he met Charles Crawford[4] at Krishnagar.

Was a keen astronomer and after becoming SG. made regular obsns. at SGO., and corresponded with Goldingham about the geographical positions of Calcutta and Madras [163–4, 167–8, 180–1].

He continued to devote himself to the improvement of his map of India, more especially as regards the territories won to the Company through the Marātha War of 1803–6 [179, 219–20, 244, 254–5]. In 1807 he left office at Calcutta in order to carry out a "survey of the Ceded and Conquered provinces in Upper Hindoostan". After continuous work in the field for over a year he was taken seriously ill with dysentery, and on his return journey from Rohilkhand died at Bhāgalpur, Sept. 1808. Of his 30 years service in India the last 19 had been wholly devoted to survey.

A full account of the last 8 years of his life and work will be given in another volume [65].

CONRADI, F. Lewis. Mad. Art.

Lt.Fwkr. 1756.

15-6-54, Mad. Council write to Chief of Devicota,

"We are informed that Mr. Conradt [*sic.*], belonging to Capt. Ziegler's Company, has some knowledge of the Engineer's business, particularly the drawing of Plans etc. ... He is to be sent to Madras "[5].

1755, Made a large-scale plan of Ft. St. George & Madras [93].

1756, Lt.Fwkr in the Train, and Asst. Engr.

COSSARD, Charles. see TERRANNEAU, de.

COTSFORD, Edward. Mad. Engrs. & Civ. b. 6-3-40. d. 25-5-1810.

Writer, 1758, Ens. 1-1-59 ... Capt. 8-10-64.

MMC. 26-1-69, Elected for Civ., and surrendered comn. in Engrs. [272].

Resdt. at Ganjam from 1766; Mad. Council & Chief at Masulipatam, 12-1-77; to England in 1780.

Son of William and Mary Cotsford of Mary-le-bone London. Took a regular course of Merchant's Accounts, or book-keeping, at an academy in Great Windmill St[6].

His widow m. Sir Morris Ximenes, Kt.

Holzman (138).

Ens. and Pract. Engr. from the first formation of the Mad. Engrs. as a regular body [271–2].

Present at siege of Madras by French, Dec. 1758[7] till Feb. 1759 [93]; at siege of Wandiwāsh, Nov. 1759, remaining there after capture as Engr. in charge.

1761, with Engrs. at siege and capture of Pondicherry, then sailed with fleet to attack Mahè, which had however surrendered to Hector Munro 13-2-61. Recalled in Aug. from Tellicherry to take part in siege of Vellore, marching overland, and reaching Vellore 10-12-61[8].

1762, with expn. to Manila[9]; 1764, present at siege and capture of Madura, after which he returned to England to recover his health; 1766, "permitted to return and be restored to his rank in the Engineers and also in the Civil as before", reaching Madras 11-9-66[10].

1766, Madras Council received authority to take over Northern Circārs, and resolved that "As we have all along intended that Ganjam should be resettled as soon as our affairs with Nizam Ally were concluded [91], ... and it being therefore necessary that the Servant sent thither should be one qualified for securing the Settlement, Mr. Edward Cotsford, who may act both as an Engr. & Resident, is appointed to proceed thither. ...

"It is agreed that Mr. Cotsford do now proceed to the Northward, make himself acquainted with the investment at the different Factories, and if he has time, that he do assist in finishing the Fortifications at Vizagapatam and, if he finds the country sufficiently settled to proceed to Ganjam, he is to survey the Factory and report to us its condition, with that of the Country about it"[11].

After a few months reconnaissance Cotsford found the country too unsettled to accomplish anything without troops, and returned to Madras, but in May 1768 he returned to Ganjam, with the support of Peach's brigade.

For the next five years he administered his turbulent province with energy and tact, and succeeded in mapping a considerable area in the course of his other duties [3, 92–3, 271].

1773, Recalled to Madras and acted on Council for a few months before taking leave to Europe[12]. On return to India, held charge at Masulipatam till he returned once more to England 1780. 1781, Appd. 2nd in Council, and nominated to succeed as Governor if anything happened to Lord Macartney[13], but never returned to India to take up appt.; *IO Tract* 59. Letters to CD. *re* successor to Lord Macartney 1784.

Succeeded to a substantial inheritance on death of his mother in 1783, and purchased manor of Clist St. Mary, Devonshire. 1792, Became Sheriff of Devon; 1784, elected M P. for Midhurst[14].

[1] Mackenzie II (48). [2] Carey (120). [3] *As. R.* VII, 1801 (1–31). [4] SG. Bengal, 1813–5. [5] Love. II (470). [6] WP. 21-9-57. [7] Journal of siege, Orme MSS. 63 (81). [8] Vibart I (54, 57). [9] *Plan of Bay of Manilla*, BM. K 115 (39). [10] MPC. 11-9-66. [11] MPC. 2-12-66. [12] Maltby (111–33). [13] CM. 5-1-81. [14] Holzman (138).

CRIDLAND, John. Ben. Engrs.
d. Dec. 1769, in India.

Ens. 15–9–67 ... Lieut. 1–4–69.

Granted gold medal as "prize of honour" at R M A., 5–6–65[1].

1767–9, Survr. with Peach's Ben. dett. N. Circārs, making surveys in Chicacole, Kimedi, and Tekkali districts of Ganjam [92].

DALRYMPLE, Alexander. Mad. Civ.
b. 24–7–36[2]. d. 19–6–1808.

Writer 1–11–52; ... Dismd. 21–3–71; ... Appd. to Madras Council, 4–12–75; ... Dismd. 1777.

Hydrographer to EIC. 8–4–79; to Admiralty 1795.

7th son, in family of 16, of Sir James Dalrymple, Bart., of New Hales, co. Edinburgh, and Lady Christian, dau. of the Earl of Haddington.

FRS.

DNB.; Holzman (139); Autobiography with portrait [pl. 17], *Eur. Mag.* Nov., Dec. 1802 (323, 422); Markham (403–5); *As J.* I. 1816 (420).

"Alexander...was taught GEOGRAPHY by his father, not learning by rote the *names* of *countries*, *capitals*, and subordinate *towns*, but by Sir James shewing his son the *Maps*, and pointing out those distinctions of *form* and situation, which were likely to make an impression on a child's *attention*, and fix that impression on his *memory*. ... As he left school before he was fourteen years of age, and never was at the University, his scholastic endowments were very limited. ...

"Alexander...conceived a strong desire of going to the East Indies, by reading Nieuhoff's voyages and a novel... .

"Left Scotland in the spring of 1752. ... On the 1st of November 1752...was appointed a Writer in the EIC.'s service, and on the 8th of November stationed on the *Madras Establishment*. ... Wanted a few months of *sixteen* years of age. ... About the middle of December embarked at Gravesend on board of the Suffolk Indiaman; ... sailed from the Downs the 26th, ...arrived at Madras on the 11th of May. ...

"At that time writing a very bad hand, was not at first employed in the Secretary's Office, but...was put under the *Storekeeper*, where he could neither learn any thing worth learning, nor was he in the way of being taken notice of. ...

"Lord Pigot [143 n. 8] perceiving that Alexander wrote a very bad hand, instructed him to hold his pen, and write with ease to himself. From this instruction he benefited more in a few days than by anything he had been taught at school; and speedily attained to write a very good and fluent hand. ... To this instruction the Public are, in some measure, indebted for whatever excellence there is in the writing to the *Maps* and *Charts* published by Alexander Dalrymple.

"In this early period of his life, Mr. Orme the distinguished Historian [qv]...shewed him great civility, and wanted to have him appointed his Sub-Accountant; ... he ever after shewed him countenance, and gave him the free use of his valuable library"[3].

After the siege of Madras, 1758–9, Dalrymple obtained the permission of Lord Pigot to undertake a trading mission to the Eastern Islands; he sailed, 22–4–59, in the *Winchelsea*, commanded by Thomas Howe [339], "and from that able navigator...received his first nautical tuition" [183]. Arrd. at the Strait of Singapore, transhipped to the *Cuddalore*, comdd. by George Baker [83 n. 11]; visited the Sulu Is.[4] and concluded a commercial treaty with the Sultan.

During this voyage he made surveys of the N. coast of Borneo and coast of China as far as the "Islands near the Entrance of the Canton River", and explored the great archipelagos[5]. Great interest in his explorations was taken by Admiral Kempenfelt and, after Dalrymple's return to Madras, 28–1–62, it was at one time proposed to commission the *Royal George* [317] to return with a cargo to Sulu.

It was, however, the *London* to which Dalrymple was given a comn. as Captain, and in which he invited Rennell [qv] to accompany him as surveyor. This second voyage was not a commercial success; "To the substitution of the London for the Royal George may, in a great measure, be attributed the misfortune of the voyage; for the Indiaman that was to follow could not find her way to Sooloo, and carried the remainder of the cargo to China, from whence it was sent to Manila, then come into our possession, and from thence sent to Sooloo, and indiscreetly delivered before the former account was settled".

The London arrd. back at Pulicat, 19–3–63, after many adventures, fully described in journal kept by Rennell[6] [qv]; on return journey they called at Balambangan off the N. end of Borneo, and Dalrymple negotiated the grant of that small island to the EIC.

The venture with the Sulu Is. was persevered with, and Dalrymple embarked once more, 5–7–63, with another cargo, this time in the *Neptune*, with permission to take a passage home to England from Canton. On this voyage he "got a grant for the Company of the North end of Borneo and South end of Palawan, with the intermediate islands"[7].

His interest in Sulu kept him at Manila till that place was handed back to the Spanish in April 1764, when he moved to Sulu, living there "in a small galley, without any other European" till October, when he got a passage to Canton and on to England, arriving 10–7–65.

He writes that "from the time he returned to England in 1765" he "was almost constantly engaged in collecting and arranging materials for a full exposition of the importance of the Eastern Islands and South Seas; and was encouraged by the Court of Directors to publish various Charts &c.", and to this collection and publication of charts of India and the east Dalrymple now devoted the remainder of his life [15, 16, 17, 83–4, 251].

1770, Nominated Governor of Balambangan but, falling into dispute with the Directors, was dismd. before leaving England[8].

1775, Sent out once more to Madras, this time as Member of Council to his old patron Lord Pigot, who soon found himself in direct opposition to the majority of his Council, with Dalrymple one of his few supporters. Having arrived in Madras Dec. 1775, Pigot was arrested by his Council Aug. 8th 1776, and Dalrymple was suspended at the same time [256 n. 6]. The unfortunate Governor was kept in confinement whilst reference was made to England, but died before orders arrived [303]. Dalrymple was more fortunate in that he was promptly sent home, travelling overland by Cairo and Alexandria[9], probably in company with Irwin [qv].

[1] Jones. [2] Gives his own birth (*Eur. Mag.*) 24–7–37, but certificate with WP. gives 1736. [3] *Eur. Mag.* 1802 (323–5). [4] between the Phillipine Is. and Borneo. [5] Memoirs pub. 1771, Dalrymple. [6] cf. M. to CD. 31–5–63 (17). [7] *Eur. Mag.* 1802 (*323). [8] CM. 5–9–70 & 21–3–71. [9] Letter from Dalrymple, dated Alexandria 19–1–77; H M S. 129 (579).

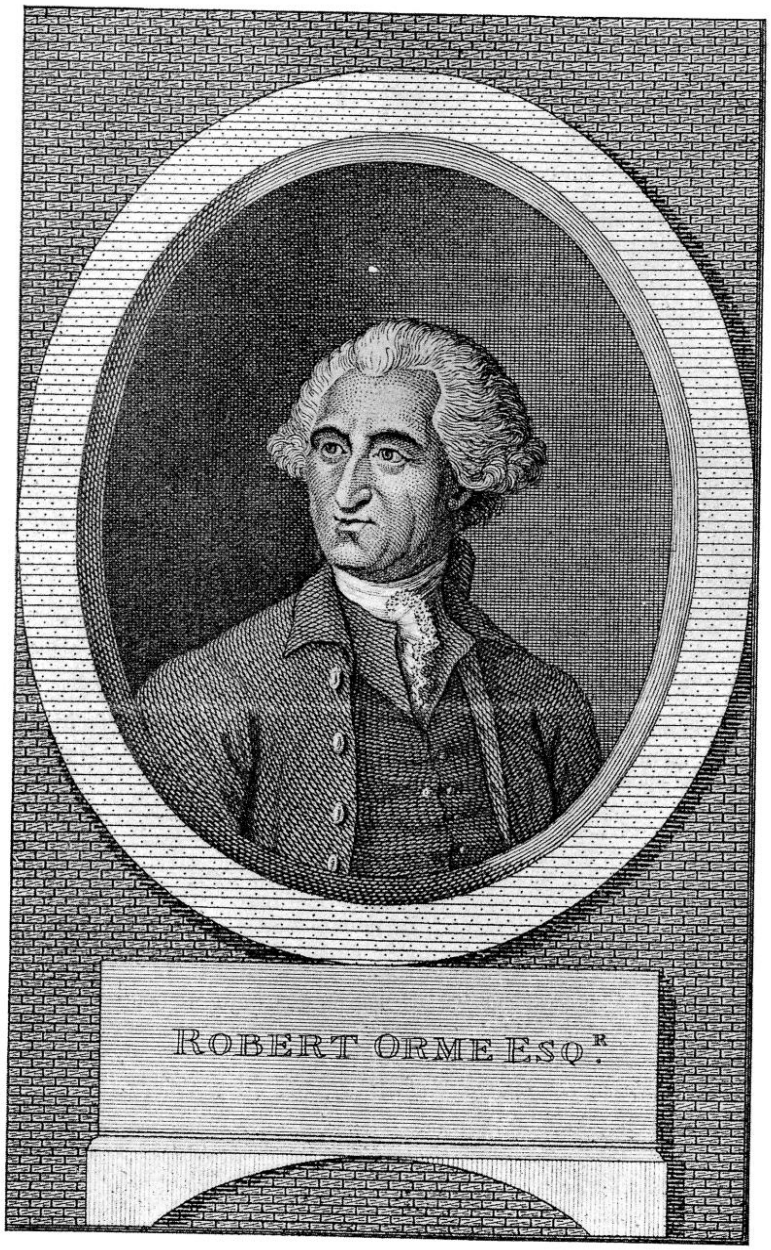


Engravid by Ridley from an original drawing by John Brown

Dalrymple

ALEXANDER DALRYMPLE
HYDROGRAPHER TO E.I.C. 1779—1808.

Plate 18.



ROBERT ORME, HISTORIAN.
From an Engraving appearing in the *European Magazine* of April 1801.

During his few months on the Council he had taken particular interest in the maps of the Presidency, and had initiated the large-scale survey of the "Home Farms" carried out by Dugood [143]. Before his departure he found time, 7–10–76, to observe the astr. position of Madras[1] [180], but he had to write from England two years later asking that his "Papers, Charts, and Books" should be sent after him[2].

8–4–79, Appd. Hydrographer to EIC., a special call for nautical sketches, journals, and ships' logs being made, many of which are still preserved at the IO. [5, 45, 88, 99, 125].

In addition to numerous charts of the coasts of India, China, and the Eastern Islands[3], he published intermittently a long series of *Tracts, Memoirs*, and other papers of interest to Indian geography, besides many of political and economic interest[4]. His best known publication is the *Oriental Repertory*[5], pub. in four volumes from 1791 onwards [100, 105, 112].

One of his most interesting papers is an *Essay on the Most Commodious Methods of Nautical Surveying*, first published in 1771 [183–4]. In another paper he called attention to the feasibility of measuring the length of a degree along the Coast of Coromandel [164, 190], and the principles of survey set forth in this paper bear a marked resemblance to those followed by Michael Topping [183–4, 190].

In 1791 the Company granted him "an annuity of £ 500 for the term of his natural life" [259][6].

"In 1795 the office of Hydrographer to the Admiralty was created, and Dalrymple was the first to hold it, together with the same post at the India House. He filled it until 1808, when he was suddenly called upon to resign. ... He declined to do so, and was summarily dismissed on the 28th of May. On the 31st he published *"the Case of A. Dalrymple"*, bitterly complaining of the treatment he had received. It broke the old man's heart, and he died on the 19th of the Following June".

As regards Dalrymple's geographical work, Markham rightly remarks that he "was more an industrious collector of materials than a compiler"[7]. His greatest services to the geography of India were his continual demand for accurate knowledge of the coasts, and his publication of the material collected [85, 243, 268].

D'ANVILLE, Jean-Baptiste BOURGUIGNON
French Geographer.

b. 11–7–1697. d. 28–1–82 in Paris.

La Grande Encyclopédie[8].

Son of Hubert Bourguignon and Charlotte Vaugon. His family name was Bourguignon, and it is under this name that his works are catalogued at the British Museum.

His more important geographical works concerning India have already been described [1, 210, 233], but he also compiled maps of all parts of the world. His earliest Indian works were his map of Tibet compiled from materials sent home by the Jesuit missionaries of Pekin, and pub. by Du Halde [70, 74 n. 4, pl. 7], and the map of South India compiled from material received from Père Bouchet, pub. 1737 [238]. His great map of India was pub. 1752 [pl. 13], with another of the Coromandel Coast, 1753 [86, 89, 238–9].

It has been written of him; "In D'Anville's system of work, books professedly geographical formed the least portion of his studies, while those of all the ancient and modern historians, travellers, narrators of every description, were assiduously examined. He studied also the philosophers, orators and poets, but only for the sake of the occasional geographical lights which they afforded; for it was remarked that in perusing these works he was totally indifferent to everything which did not tend to fix a geographical position. His life work extended over a vast field.

"It was D'Anville who first set the example of accompanying the map with a memoir exhibiting the data on which it had been constructed" [4, 169, 176, 211][9].

A full list of his works is given in a *Catalogue des Livres du Cabinet de feu Delatour*, Jan. 1810[10], which also contains an *Éloge* written in 1782, of which para. 8 reads, "Les Anglais ont si bien apprecié le mérite de ses cartes et de ses ouvrages, qu'ils les ont presque tous fait passer dans leur langue; ils ont même une telle estime pour lui, qu'ils ne croient pas pouvoir honorer davantage leur plus habil géographe actuel (le major Rennell) qu'en l' appellant "le d'Anville de l'Angleterre".

His *Eclaircissemens Géographiques*, pub. 1753, is well worth reading, either in the original or in Herbert's translation; he had collected far more information than might be expected for such an early date, and it was not his fault that many of the astr. obns. and recorded distances which he used were far from precise.

The closing words of his preface [*Title page*, 210], are worthy of the great geographer that he was, praying for further increase of knowledge that should cause his map to give place to a better.

His *Antiquité Géographique de l'Inde* was pub. 1775 [211]. He continued to take the greatest interest in the geography of India, and corresponded and exchanged maps with Robert Orme[11] [qv], though in a letter of 26–4–74 he regrets that he can say little about the maps sent for his criticism owing to "la faiblesse de ma vue" [115].

D'APRÈS, see APRÈS de MANNEVILLETTE.

[1] Note on reduced map of *jagīr*, Orme MSS. 65. [2] CD to M. 23–12–78 (71). [3] List of Charts pub. 1771 & 1787, bound with various Tracts; Dalrymple [123 n. 3]. [4] List of 59 publications other than nautical, *Eur. Mag.* 1802 (422–4). [5] Wrongly called "Repository", Markham (403) [6] C Cor. 13–4–91. [7] Markham, (403–5). [8] *sv.* Anville. [9] *Cyc. Ind.* III. [10] *IO Tracts.* 284. [11] Orme MSS. 50 & 72 (155 *et. seq.*).

D'AUVERGNE, James. HM's 100th Foot. d. 15–3–1804, "on board his Budgerow off Houghly".

Ens. *c.* 1781 ... Lieut. 22–7–84 ; Resd. 1785–6.

Possibly related to Maj. Gen. James D'Auvergne, of Jersey, 1st Troop of Horse Guards.

Eldest bro. of Capt. Philip D'Auvergne, "Prince of Bouillon"[1], Ben. Inf. (Hodson), and possibly son of Philip D'Auvergne, comdg. *Scarborough* East Indiaman, 1747–50.

Dec. 1781, Arrd. Bombay with 100th Foot under Humberstone, landing Calicut Feb. 1782 [99 n. 1, 125]. June 1782, Appd. Asst. Engr. Tellichery, having survd. route Ponnani-Calicut [123][2]. Oct.-Nov. 1782, Survd. Humberstone's route Tanore-Palghāt [99].

After reduction of regt., 1785–6, appears to have taken up trading and contracting in Bengal; shown as trader at "Boggah" in *Bengal Kalendar* 1791–6, and in *East Indian Register* 1803–5.

1786, Survd. Dinapore Cant.[3]; 1793, SG. received copy of "a most accurate survey of a road from Gya to Sherghauty in Behar" executed by Lt. D'Auvergne[4].

1807, SG. submitted to Govt. for despatch to England a survey of "the Lands, Publick Buildings, Enclosures, Tanks &c., immediately appertaining to the Governemnt Stud at Poosha[5] ...with...Elevations, Plans, & Sections of the Buildings, by James D'Auvergne"[6].

DAVIDSON, James. Ben. Inf. d. 4–8–1802, Monghyr.

Ens. 27–3–77 ... Maj. 31–7–99 (4th N.I.). Hodson.

From 1790, Comdg. escort with George Forster, [337], Resdt. at Nāgpur; SG. considered his journal of route, Cuttack to Nāgpur, a "very valuable geographical communication, for which Lt. Davidson deserves much praise and thanks" [42, 187].

Reported from Nāgpur, Dec. 1792, that he had received a letter from Blunt who had passed by on his survey through Central India with Anburey[7] [43].

DDn. 67 (278), 22–10–1803, SG. refers to him as "the late Lt.-Col. Davidson".

DAVIS, Samuel. Mad. Inf. ; Ben. Civ. b. 1756–7. d. July, 1819.

Ens. Mad. Inf. 4–2–80

Writer (Ben.) 27–8–83 ; Senior Merch. 1795 ; Resd. 21–2–1806.

Younger son of John Davis, Commy. Gen., W. Indies.

m., Burdwān, 24–9–94, Henrietta, dau. of Solomon Boileau of Dublin, sister to John Peter Boileau, comdg. Resdt's. escort in Nepāl 1817.

Father of Sir James F. Davis, KCB., 1st Bart., and Governor of Hong Kong.

DNB. ; DIB. ; Hodson.

7–3–79[8], sailed in *Earl of Oxford* as cadet for Fort St. George ; arrd. Madras 18–1–80[9]. Made a sketch "in and about Guntur Circar" [99–100].

A D C. to Sir Eyre Coote, and sailed with him from Madras to Bengal in the *Medea*, 28–9–82.

Petition for appt. as Writer read by Directors, 11–12–82, and admitted as such in Bengal 27–8–83[10].

According to his son, "Mr. Davis went out to India as an engineer officer[11], ... but with the privilege...of leaving the army if he wished it, and becoming a civilian. The first station he went to was Madras ; and here he became aide-de-camp to the commander-in-chief, and went with him to Calcutta, where, soon after his arrival, he was appointed, from his known talents for surveying, to accompany Mr. Turner in his embassy to Thibet. During this expedition he made a large collection of excellent plans and coloured drawings. ... On his return to Calcutta, thinking that the civil service afforded more prospect of advancement, he left the army, and obtained the appointment of collector of Burdwan"[12].

This account is not wholly supported by official records ; for Davis went out to the Inf. at Ft. St. George. Turner records that "Lieutenant Samuel Davis" was "appointed to accompany me...as Draftsman and Surveyor"[13], and would surely have mentioned the fact, had he been an Engineer officer. Further, his appt. as Writer was sanctioned in England before he joined Turner's mission.

It was in March 1783 that the G G. recommended that he should accompany Turner's mission "in the capacity of Surveyor, with the established allowances. ... He is particularly desirous of making this use of the known talents of Mr. Davies"[14].

His sketches of the Bhutān mountains attracted much admiration, but were the cause of his being left behind when the mission moved forward towards Tibet on Sept. 8th, owing to "the suspicious caution of our conductors"[15]. Many of his sketches are published in Turner's narrative [74].

His obsns. made to the snowy peaks on the march to Bhutān were used by Sir William Jones in estimating their distance [77].

After his return, March 1784, Davis held various civil posts at Bhāgalpur ; 1793, tr. to Burdwān ; 1795, to Benares. At Benares he was the hero of the disturbances of Jan. 1799, when he defended his family against a large mob, holding the head of the stairs leading to the roof of his house, single-handed, and armed only with a footman's pike[16].

From 1800 held several important posts at Calcutta, finishing as Acctt. Gen.

A Director of the EIC. from 1810.

Author of several papers on Hindu Astronomy[17].

DAVY, William. Ben. Inf. d. 1784, on voyage home.

Ens. 11–12–67 ... Maj. 24–2–82 ; Resd. 22–1–84. Hodson.

1769, as Ens. in 3rd Bri., survd. "Road from Allahabad to Corah"[18] and on "to Alawa, with limits of Corah Province and several cross roads ... to the Jumna [29 n. 4]"[19].

Persian Secretary to GG. till he left India 1784, carrying with him letters from Warren Hastings to the "Beloved Marian, his wife"[20].

[1] *Calcutta Monthly Journal*, March 1804 (243). [2] Bo S & Pol. 13–9–82. [3] BPC. 9–1–86 (20) [4] MRIO. M. 574, 30–4–99 ; still preserved "Survey of a High Road lately made...with plan of Gaya", MRIO. 62 (46). [5] Pusa, 72 G/9. [6] BMC. 19–8–07 (113). [7] B Pol. C. 35–2–93. [8] Emb. Lists give age 22 ; CD to M. 23–1–79. [9] MPC. 4–2–80. [10] HMS. 79 (5) ; CM. 11–12–82. [11] Clements Markham (lxxi) & Hodson follow Davis on this point, not knowing of the appt. to Mad. Inf. [12] Davis (86–7). [13] Turner (3). [14] BPC. 13–3–83. [15] Turner (168). [16] Davis ; Clements Markham (lxxi) *Calcutta Review*. I. 1844 (246–50). [17] *AsR.* II (225), III (209), IX (242). [18] Kora, 63 B/8. [19] Orme MSS. 65 (47), & 13465. [20] Grier(216).

Being a recognised authority on the transliteration of oriental names, he assisted Rennell with the names on a Persian map of the Punjab [249], whilst Prof. Joseph White[1], Oxford University, acknowledged his help with a translation "from the Mogul language. ... His perfect knowledge of the language, intimacy with Oriental authors, ... render him a very competent judge of the subject. ... In writing the name of the Arabian Law-giver (as well as all other names of Persons and Places introduced...) I have adopted the Orthography of Mr. Davy, whose accuracy of pronunciation was well known in the East "[2].

DAW, —. Bengal.

Probably before 1770, survd. roads in Chittagong Dist., with astr. lats. [153].

DAWES, Robert. Ben. Inf.
d. 21–11–63.

Ens. 13–9–68 ... Lt.Col. 1–3–94 ; Ret. 2–11–98.

Hodson.

Ed. as cadet at RMA. ; Entertained to be Frwkr. in the Art.[3] but posted to Inf.

In 1776 Rennell issued instructions to Dawes for survey of unexplored parts of Allahābād and Oudh, and referred to an earlier survey by him [183]. In 1786 the SGO. held "A Survey of the Ganges below Hardwar, in 6 pieces" and "Routes and Remarks in Allahabad, Benares etc.", all by Dawes [36].

DE FUNCK, James. Bom. Art.

Capt. of Art. & CE. 1752 ; Resd. 1757–8 ; Lt.Col. 15–2–62.

Spring.

Had been Capt. in Royal Regt. of Swedes in France. 1752, engaged to serve the EIC. for 7 years, all Engrs. being borne on the strength of the Art. [266]. Employed on fortifications and survey [273].

His *Plan of Bombay Town*, with description and covering letter dated 9–3–56, bear the elaborate autograph "de Funck" [120].

1755, Survd. coast between "Mt. Dilla and Mahé" by measurement and compass [123].

1756, Council reported that the fortifications under De Funck "make slow progress", and that he had been "acquitted by Courtmartial of Disobedience of Orders, since the message from the Governor to Capt. De Funck was delivered by Capt. Cameron [324] in such a manner that it could not be looked on as an Order "[4].

Spring says that he was dismissed for disobedience of orders, but he was actually allowed to resign[5], and on return to England was granted £ 500 as "compensation".

DE GLOSS[6], Luis Felix. Ben. Engrs.

1st Lieut. Bom. Art., 20–8–53 ; Capt. & Engr. Bom. Art., 13–4–58 ; Capt. Bom. Engrs. 6–2–59 ; Bt. Capt. Bengal, 9–2–64, with comn. as Engr. ; on re-formation of Corps of Engrs., 22–10–64, appd. Capt. & Director of Ben. Engrs. ; Bt Lt Col. 21–1–73 ; Resd. 4–2–73.

Son of "Frederick Daniel De Gloss, whose lands were at Lublin & Cracow, Poland".

m., Bombay, 2–4–55, Miss Margaret Edgerton.

Hodson.

Granted comn. in Art. by Directors in London, to take effect from arrival in Bombay.

Employed on surveys and "took plans of and surveyed the works of Bombay, the Castle, and all the Forts in the Island [120, 273]".

His large-scale plan of the Town of Surat. 1753, bears title in French, but names and references in English ; he also made, 1759, "a true and exact plan of Surat Castle [120][7].

8–10–57, Appd. Clerk of the Works ; 1760, present at siege of Surat, and in command there for nearly 3 years.

1764, as volunteer to Bengal, where the Council report that "the great want of Capable and Experienced Men, to assist in conducting our Engineering Business, has induced us to entertain Capt. Lewis Du Gloss, belonging to the Artillery Establishment at Bombay. ... We have granted him a Brevet Commission as Captain, intending to employ him at the New Fort under Capt. Polier" [qv][8].

Appd. to comd. a company of Eur. Pioneers, about 40 strong, and sent up to the Army at Patna[9] ; the following year these Pioneers were broken up, and, 19–2–65, De Gloss was appd. additional Surveyor[10]. After making a survey of the Cossimbāzār R [17] he took up the survey of Burdwān and Midnapore, where his chief concern was the survey of river embankments for the prevention of floods [2, 22, 225, 269].

Sept. 1766, Ordered to Bihār, and spent nearly a year on a survey up the Son R. and along the hills to the south of Gaya as far as Monghyr. His interesting journal is preserved at the IO.[11] ; his English is weak and he uses many French words and expressions [25-6, 234, 283, 289, 294].

Came under Rennell's orders from the beginning of 1767 [32] ; Sept., received orders to survey the north bank of the Ganges up to Patna, and then the Gandak as high as feasible, with a view to facilitate the transport of "Firr Trees" which were wanted at Calcutta for ships' masts, and similar purposes[12] [20, 23, 26]. This survey he completed by March 1768. [26-7, 33, 225].

He was then placed in comd. of Dinapore Cant., where he remained for the next two years, having set up a foundry for casting "field pieces & Mortars, and for the construction of guncarriages and other military stores". In 1770 he was brought down to Calcutta to start a similar foundry [153].

He now became very anxious about his military promotion, and addressed a petition[13] to the Council, asking for "some indulgence for my upward of twenty years service to the Hon'ble Company in India, ... the latter part of which has been mostly employed not surveys, ... a very Fatiguing duty in this country. By being out at all seasons and exposed to the inclemency of the Weather, my health is very much impaired and my constitution quite broke ; so that I find it at present...absolutely necessary that to preserve my life a few years longer, I must return to my Native Country. ...

"From my being so unfortunate as not to have any particular friends in the Directorate, and in a manner unknown in England, repeated supersessions have very much injured my rise in the Army. ... The oldest Lt. Colonels, either on this or the Bombay Establishments, were but Subaltern Officers when I had the honor of bearing a Captain's commission".

But in 1766 the Directors had issued an order that no foreigner was to rise to higher rank in their service than Major, cf. Polier (qv)[14]. and the utmost that they would now do for De Gloss was to give him the brevet rank of Lt Colonel on the condition that he forthwith resigned the service. He therefore

[1] *DNB.* [2] *A Specimen of the...Institutes of Timour, or Tamerlane, 1780.* [3] CD to B. 16–3–68. [4] Bo to CD. 15–12–56 (141). [5] ib. 7–2–58 (18). [6] Tho' name frequently spelt Du Gloss, he signs De Gloss. [7] *Imp. Lib.* M & P. 369. [8] B to CD. 20–2–64 (24). [9] Broome (446). [10] BPC. 19–2–65. [11] Orme MSS. 9 (16) bears a clear autograph. [12] BPC. 17–12–72 (11). [13] With a history of his services, BPC. 17–12–72 (11). [14] CD to B. 19–2–66 (54).

resd. his comn., and sailed from Calcutta, Feb. 1773, in the *Duke of Grafton*.

Before he left he sd. his will, making the following provisions. He asks to be buried in ground consecrated in the Protestant religion. He makes provision for Mrs. Margaret De Gloss, at present at Anjengo [96 n. 1] also for "Anna Louza de Rozario of Calcutta, single woman, who is to keep the House, Furniture, Slaves, etc., now in her possession, with interest on a sum of Rs. 8,000 for life". Bequests are also made to his slave Anthony, with his freedom, and to other slaves and servants[1].

May 4th 1774, after his arrival in England, the Directors "Resolved that Major Louis Du Gloss, in his retreat from the Company's Service be granted a Brevet for the rank of Lieut. Colonel, that he may carry with him to his Native Country that honorary Testimony of their Approbation of his active and faithful conduct, during a course of Twenty years Employed in the Company's Military Service under the Presidencies of Bombay and Bengal"[2]. Again, in the following month, "Lt. Colonel du Gloss...on account of his past long and faithful services to the Company, and his present distressed situation, be allowed the sum of £ 100 from the Contingent funds"[3].

DE HAVILLAND, Thomas Fiotte. Mad. Engrs.

b. 10–4–75. d. 23–2–1866 in Guernsey.

Ens. 3–5–93 ... Lt Col. 1–5–1824; Ret. 20–4–1825; Hon. Col. 28–11–1854.

Son of Sir Peter de Havilland, Kt., of Guernsey.

m., 1st, Madras, 3–9–1808, Elizabeth, dau. of Thos. de Saumerez, by whom he had issue 2 sons and 2 daus. She d., Madras, 14–3–1818, and he m., 2nd, 6–8–1828, Harriet, dau. of Anthony Gore, by whom he had no issue.

Oriental Club.

DNB.; DIB.; Vibart. II.

13–12–95, Appd. Asst. Engr. under Mackenzie [qv] for expn. to Colombo.

Probably before 1798, Survd. "A Sketch from Tanjore, West to the sources of the Colleroon"[4].

Mysore Campaign of 1799, attd. to Lt Col. Brown's Southern Divn. of the army, which reached Coimbatore 1–8–99[5].

May 1800, submitted a map of Coimbatore and Dindigul with the following letter, "In the course of my Travels in the Southern Divn. for several years past; and particularly when doing duty with Col. Brown's Detachment during the late war, I have amused myself in surveying,[6] ...and have likewise collected every information I could obtain relative to the Geography of the Country. ... I have now made an Humble attempt at compiling a Map of the Coimbatore and Dindigul Provinces [114, 118–9, 249]"[7].

April 1800, with CE. to Seringapatam, and remained there as Asst. Engr.

(see Vol. II).

DELAFIELD, Philip. Ben. Inf.

d. 25–10–83, in England.

Ens. 7–4–65 ... Capt. 14–9–67.

m., Calcutta, 25–7–72, Mary, sister of Adm. Sir Albemarle Bertie, Bart. Their dau., Priscilla, d., Chunār, 16–7–74, MI. Broome (600); Hodson.

Rennell refers to his "cursory survey from Goodwater Island to Cape Comorin"[8], and for many years this was preserved in SGO., "Sketch of a route from Tutacorin to Kilkary, Ramanadapooram and Madura, reduced from the original done by Ens. P. Delafield in Nov. 1764"[9].

Identity by no means certain, for no explanation can be given as to how this Bengal officer made surveys in S. peninsula; on the other hand, the only Madras officer of the name was Richard Delafield, Ens. 5–9–70.

1775, Dismd. by ctml., owing to discontent in his batt. due to "his intemperate and improper conduct as Commanding Officer"[10].

DES VOEUX, Charles Philip Vinchon. Mad. Engrs. & Civ.

b. 3–11–45, Dublin. d. Aug. 1814.

Ens. 1–12–63; Writer, 1763 ... Senior Merch. 1774.

Son of Rev. Anthony Vinchon Des Voeux, Chpn. of H M's Regt. of Horse Carabiniers, formerly of Bacquecourt, Normandy.

cr. Bart. of Indiville, Queen's co., 1–9–87.

1763, sent out as Writer and appd. to Engrs. after arrival Madras [272]. 1765, O C. troops reports "Mr. Des Voeux Engineer, left at Ongole to carry out repairs, and will be the more able to compleat his chart of all our marches, and of this Country"[11].

Probably resd. Engr. comn. before April 1766.

1768 to 1771, to England for recovery of health.

DODSWORTH, Francis Alexander. Ben. Inf.

d. 6–1–96.

Ens. 21–11–71 ... Capt. 25–2–81.

Hodson.

28–10–76, with 6th Batt. of Sepoys, stationed at Chittra, appd. asst. survr. with Ranken [qv] on survey in Rāmgarh [270]; survey closed three months later [36].

DON, Patrick. Ben. Inf.

b. 1756–7. d. 16–1–1837.

Ens. 1778 ... Lt.Col. 30–9–1803; Furl. from 18–2–1808; Ret. 29–8–1810.

EIMC. II; Hodson.

20–3 to 23–4–1799, Survd. route from Gorakhpur to Bahraich [189]; obsd. high snowy peak, 20–4–99[12].

1803–4, Comdg. column under Monson against Holkar.

DOUGLAS, Patrick. Ben. Inf.

b. 1758. d. 16–3–1821.

Ens. (Engrs.) 9–12–70; Lt. (Engrs.) 17–11–73. Reverted to Inf. 4–6–76; Lt Col. 6–12–97; Ret. 30–7–1800.

m., Calcutta, 1787, Jane, dau. of Lt Col. John Fortnom, Ben. Engrs.; hence bro.-in-law to Andrew Pringle [qv]

Hodson.

Reversion to Inf. ordered in Directors' letter of 28–11–77, on representation by John Call of the injustice of his being brought into the Corps of Engrs. over the heads of Thomas Call [323] and others.

1781, Survd. route of Pearse's Dett., Midnapore to Madras, except between Surapjedah and Ellore, where interrupted by damage to perambulator [41, 199].

Large-scale plan of action, 20–1–82, between Eyre Coote and Haidar Ali bears the initials P.D[13].

DU PERRON. see ANQUETIL-DUPERRON.

DU PLAT, Peter Joseph. 16th Regt., Corps of Hanoverians [99 n. 4].

Arrd. Madras as Lieut., 1782; called Capt. in 1788.

[1] Ben. Wills, 154. 59 (196). [2] CM. 4–5–74. [3] Lord Clive's Fund I. [4] DDn. 246 (127). [5] MMC. 4–8–99. [6] cf. Colebrooke [327]. [7] MRev. Bd. 12–5–1800 MRO. Map, described by Montgomerie in 1826 as "pretty good". [8] *Memoir*, 1783 (24). [9] DDn. 246 (144). [10] cf. Williams (53). [11] MS & M. 29–7–65. [12] Fdbk. MRIO. M 277. [13] MRIO. 136 (2, 3).

Bro. to George Wilhelm du Plat, of Hanoverian Survey Dept. 1764–86; several of the family were topographers of the Hanoverian army[1].

Assisted Schlegel [qv] with surveys & maps [99], and with Wersebe [qv] distinguished himself in the S. Peninsula [268]. Was bequeathed a number of Wersebe's sketches and journals.

Returned to Europe with his regt. 1792[2].

DUGOOD, Alexander. Mad. Engrs.
d. 1778–9[3], in S. India.

Ens. 20–3 or 27–5–71 ... Capt. 20–1–75.

1768, Arrd. Madras, a private soldier of Inf., "in the Military", in the *Seahorse*[4]; acted as dman. in CE.'s office from Aug. 1768.

MMC. 27–5–71, Appd. Ens. & Pract. Engr.

Marawar campaign of 1772, survd. route from Trichinopoly to Vallum [90]; siege of Tanjore, 1773[5].

Dec. 1773, Ordered to Masulipatam "to compleat the survey began by Captain Stevens" [3, 93].

MMC. 10–10–74, "Having for near three months been incapable of continuing the Survey from ill health, he is now advised by the Surgeon of Ellore to return to the Southward, as the only means of effecting a recovery"[6]. After a visit to Ganjam to survey its environs he came down to Madras at the end of Nov.

The CE., Ross [qv], complained that he could not get Dugood to send in the plans of his survey of the Circars even though he "went to the Mount Races, where he was well enough to attend the amusements during the day, and to be at night at the Public tents, and still he did not complete the plans of his survey"[7].

15–2–75, CE. sent him Govt. orders "that the Drawings of the Survey should be completed as soon as possible", and in May told Govt. that he considered Dugood to have been "a very negligent servant to the Company..., as he was appointed to the Survey of the Masulipatam Circar in Decr. 1773, on which he was only employed between 11th March & 6th June, so that...he can only have surveyed but 2 months out of the 16, and he has been from June 6th to the end of April in protracting it. ... None of the Engineers experienced in Surveying have done less than Capt. Dugood, most of them a great deal more, and he, so far from intending to exert himself, has repeatedly declared that he would never do more than he was necessarily obliged to".

"It grieves me to be obliged to point out the infirmities that have been inflicted on Capt. Dugood by the hand of Providence, and that I am now under the necessity to remark on his natural defects, but as his shortness of sight essentially disqualifies him from some of the most important duties of an Engineer, ... I hope I shall be excused. His sight is nevertheless very strong, by which he is enabled to distinguish objects at a certain distance with great precision, and as this is an advantage in Drawing or Protracting, the business of the Survey appears to me particularly well adapted for him"[8].

Dugood took strong exception to this letter, and retorted by aspersions on the CE.'s capacity as an administrative officer, and demanded a ctml. to clear himself from the charges made. Ross writes "Capt. Dugood has been remarkably industrious to misrepresent my conduct everywhere; but I doubt not I shall be able to make it appear that I have acted a consistent part, & that Capt. Dugood has brought upon himself whatever may happen"[9].

The ctml. now became the *cause celèbre* at the Presidency, and Dugood put up a stout defence. He said that after receiving orders to proceed to Masulipatam in Dec. 1773, he was helping Ross at Madras, and did not start the survey till March 22nd, working till May 10th; "Land Winds coming on, obliged me to go in to Masulipatam, where I remained till 15th July...; Was taken ill of Bilous Fever and carried to Ellore". He pointed out that Cotsford also was shortsighted[10].

Even the Governor and C-in-C. were called as witnesses and cross-examined. The decision of the ctml. was announced in GO. of 5–12–75, with the following findings;

1st. Neglect of Duty.—Not sufficiently proved. Acquitted.

2nd. Conduct to the Prejudice of good order and military discipline.—Acquitted.

3rd. Conduct unbecoming the character of an officer and a gentleman, with reference to his letter of 2–7–75, challenging the conduct of the Chief Engineer.—Acquitted; "tho' it does not appear that Col. Ross had not reason to conceive his Professional Character in some respects attempted to be sullied by the said letter"[11].

Dugood's survey, about which such a storm had had been raised, was, after all, no mean effort, and he had submitted to the CE., 27–4–75, a large-scale survey of the irrigation channels fed by the Godāvari, to which Dalrymple refers very favourably many years later [93, 105, 107][12].

During 1776 he was employed on large-scale survey in the neighbourhood of Madras, under the directions of Dalrymple [94-5, 142-3, 331], and in Nov. he was called away to be an Asst, Engr. Tanjore. Towards the end of 1777 he carried out a survey between Vallam and "Seringham"[13]; then returning to Tanjore.

EMMITT, George Lobey. Bom. Inf.
b. 1758–9. d. 1845.

Ens. H M's 65th Foot, 1–8–80; Ens. Bom. Inf. 1781; Capt Lieut. 22–3–99.

From Lincolnshire. m., Christiana —.

16–1–86, Appd. Asst. Survr. with expn. to Chagos I. sailing from Bombay 15–3–86; expn. withdrawn Oct. 1786 [123].

Continued as Asst. Survr. on Bombay est., joining Reynolds at Surat April 1789 [128, 273, 281].

Survr. with Frederick's dett. from Bombay for capture of Dhārwār, landing at Cardona at mouth of Jaigarh R., 25–11–90. After fall of Dhārwār volunteered to remain with Little's dett. and continued with it till return to Poona June 1792 [7, 113, 128–30]. Survd. not only route down to Seringapatam, both through Chitaldrug and Shimoga, but also the Tungabhadra R. from its source to junction with Kistna, and then west to Goa [187, 299]. Closed survey at Poona 3–6–92, after more than 18 months continuous work, and then allowed 3 months to finish maps[14] [177-8, 249].

[1] G. Schnath, *Die Kurhannoversche Landesaufnahme des 18 Jahrhunderts* ... Berlin. 1933-4. [2] Wylly (445). [3] Said to have been "Killed at Chittoor" 10–11–81, but admn. of will granted 4–4–79. [4] Emb. List. vol. 2, 1767–9 (30), & Mad. Muster Rolls, I O. [5] Vibart I (125). [6] MMC. 10-10-74. [7] Mack. MSS. LXVI. Progs. of GCM. 28–8–75. [8] Mack. MSS. LXVIII. 29–5–75. [9] ib. 18–6–75, to Stevens. [10] ib. 9–6–75. [11] MGO. 5–12–75, Mack. MSS. LXVIII. [12] *Oriental Repertory*. II. [13] Srirangham. opposite Trichinopoly, 58 J/9. [14] BoMC. 3–7–92.

Account of his visit, Nov. 1791, to the ruined city of Bijayanagar[1] pub. by Rennell[2].

From Nov. 1792, Employed on survey in Malabar, returning to Poona on sick leave at end of 1794 [130-2 178, 202, 299]. Jan. 1795, Survd. route of Peshwa's army to Kharda, where it defeated Nizām's force [116, 130].

Having "suffered considerably from indisposition during his late employment in the Field", obtained permission to spend rainy season at Poona, and in Dec. submitted an application for return to Europe; "It is a matter of the most mortifying to me, that from the alarming state of my health, I am reduced to the necessity of relinquishing my employment as a Surveyor. The fatigues which I have experienced, and the exertions I have unremittingly made in that duty for upwards of ten years, in various parts of the Peninsula.., have brought upon me a disorder from which I have no chance of recovery but by speedily returning to my Native Country"[3].

Furl. was duly granted by GO. of 16-12-95, and he left for England shortly after, not to return.

ERBB, George. Mad. Art.

French sergant "of Captain Illen's company" of Artillery in service of English.

Survr. and dman. of two plans of Trichinopoly and neighbourhood, showing operations against French between Sept. 1753 and Feb. 1754 [87].

EWART, James Simon. Ben. Inf.

Ens. 22-5-79; Lieut. 25-1-81; Furl. 20-11-86; Struck off. 1793.

m., 12-2-90, Catharine, elder dau. of Joseph Skinner, of Aldgate High St., London, & of Wanstead Essex, who d. 28-10-1855, aged 90.

Hodson.

10-9-78, Appd. Cadet from date of rank as Lieut. in the Bombay Marine, 18-8-78, "from the Ships under the command of Captain Joseph Price"[4].

Sept. 1778 to March 1780, Officer of a ship cruising from Coast of Coromandel by Ceylon Nov. 1778, Nicobar Islands, Straits of Malacca, Sumatra Dec. 1778, Malabar Feb. 1779, Madras April 1779, Straits of Malacca Sept. 1779, Diamond Island Oct. 1779, Fort William 16-3-80.

Throughout these voyages took regular astr. obsns, for lat. and long. and, after posting to Ben. Inf., his obsns. continue; Barrackpore Cant. Aug. 1780, Berhampore Cant. Nov. 1780, Patna Dec. 1780, and Chatra Jan. 1781 [155, 161].

At end of 1781 appd. survr. with Chapman's mission to Nāgpur, which according to G G's. instructions of 12-11-81 was "to strengthen and increase the friendship and alliance virtually subsisting between that Government and ours [4, 42]".

After arrival at Nāgpur, Ewart continued survey through the little known neighbourhood, adding to his range by sending out *cossids* to Hyderābād, Poona, Ujjain and other important places [286].

1784, brought a survey northwards from Nāgpur to Benares, where he joined his batt. These surveys cleared up much that was unknown in Central India, and by his frequent astr. obsns. their value was greatly enhanced.

Whilst at Nāgpur, "12 European vagrants surrendered to him"[5], probably deserters who had found that a free life had its disadvantages.

Ewart was probably the first survr. in India to make use of a chronometer, buying one from Thomas Forrest [45-6], and passing it on to one of the expns. to the NW. coast of America [202].

In 1786, applied to be allowed to accompany this expn. as surv. "to make astronomical observations and surveys of harbours, in which branch I have the honour of being employed...for some time past". Permission was given, but Ewart did not go; two or three such expns. set out about this time, with the object of opening up trade in furs; two of them came to grief not only through weather conditions but also through encounters with Spanish rivals[6].

Nov. 1786, whilst with 6th Eur. Batt. at Dinapore, applied for furl. and, arriving in England at end of the following April, was allowed to remain on half-pay; April 1790, permitted "to remain in England till next Season"[7], but apparently he never went out to India again, and was struck off the strength in 1793.

26-4-95, Wrote to Warren Hastings, congratulating him on the result of his trial, and regretting that he could not do so in person owing to the distance of his residence from London[8].

FALVEY, Dennis Morris. Ben. Inf. d. unm. 27-10-1806, Allahābād.

Ens. 18-9-80 ... Maj. 21-9-1804.

Hodson.

Survd. routes west of Agra as far as the Indus, and "travelled twice that way in the years 1787 and 1790; according to him there is no river nor branch of the *Indus* between *Jaysulmere* and *Baccar*[9]. He was a well informed man, who understood the country languages, and in his route he always took particular notice of the rivers which he crossed"[10].

FENNELL, Richard. Ben. Inf. d. Sept. 1774, Rāmgarh.

Ens. 19-1-69 ... Lieut. 9-5-70.

Hodson.

Served under Camac in Chota Nāgpur, and employed on survey till death [35, 225].

20-1-74, Camac reported to the Revenue Council that the Chota Nāgpur people were slow about paying the promised revenue, and had "collected the whole force of the country into a very strong hill, where they had amused Lt. Fennell for about 6 weeks"[11].

In his will, appd. his "worthy friend Jacob Camac" as one of his executors. "I give to Chowdry, a little girl what has been with me from an infant, and been particular useful and Diligent in all my sickness, 300 Sonat rupees; to Cozella, my eldest girl and took into my house at the Famine [1771], 300 Sonat rupees. To Bundu 200 St. Rs., and to other servants". The remainder to his aunt in London, Mrs. Hester Mexteed; "I have no slaves, all my people are free at my decease"[12].

FERGUSON, John. Ben. Inf. b. 7-3-43. d. 4-9-73, Cape Town.

Ens. 29-8-65; Lieut. 7-1-67; Resd. 24-1-69.

Eldest son of Rev. Adam and Amelia Ferguson, of Moulin, Scotland.

Hodson.

One of the officers of 1st Bri. who mutinied in 1766.

1767-8, comdg. column of sepoys on the western borders of Midnapore, keeping journal and sketch of his routes till

[1] 57 A/7. [2] *Peninsula.* 1793 (40). [3] Bo MC. 15-12-95. [4] BPrC. 10-9-78, *cf.* J.N. Rind. [5] BPC. 24-2-83, (20). [6] BPC. 29-1-86; HMS. 800, & *CG.* 11-11-90. [7] CM. 2-5-87; 30-4-90. [8] BM. Addl. MSS. 29174 (30). [9] Jaisalmer, 40 I, J, M; Bhakkar, near Sukkur, 40 A/14. [10] Wilford, *As. R.* xiv. 1822 (407). [11] BRC. 18-2-74. [12] Ben. Wills. 154. 56 (3).

mishap to compass; captured Ghatsila Ft. [28–9, 300]. Objected to Carter's views regarding position of frontier line [326].

Jan. 1769, to Europe on account of ill-health and, Aug. 1770, authorised "to compile a dictionary of the Hindostan Language, taking care to bring the orthography of the Hindostan words, to be printed in the roman characters, as similar in sound and accent to the English as possible[1] [248–9].

May 1773, Sailed to rejoin from England, but killed in duel at Capetown by Captain Roche under such circumstances that Roche was recalled to stand trial in England. "The case became famous in the history and the ethics of duelling during the two subsequent years "[2].

FORSTER, George. Mad. Civ.
b. *c.* 1751. d. 5–1–91, Nāgpur; M I.

Writer 1770 ... Senior Merch. 1782.
DNB.; DIB.; Forster.

1782–4, made a remarkable overland journey from India to Europe through Persia [214, 233], and pub. account 1798.

1788, on return to India, appd. Resdt. at Nāgpur [127, 301], being accompanied on journey from Kālpi by the survr. J. N. Rind [42]. On another journey, Cuttack to Nāgpur, 1790, route was survd. by James Davidson, comdg. escort[3] [42, 187, 332].

FRANKLAND, William. Ben. Civ.
b. *c.* 1720–2. d. 28–12–1805.

Arrd. Calcutta, 30–8–40; Resd. June 1758.
3rd son of Henry Frankland, Governor of Bengal 1724–5, and Mary his wife.
Betham's *Baronetage* 1802; Holzman (143).
Buxey or *backshi* [302], paymaster and acctt., Ft. William. 1756: avoided "the Black Hole" by escaping from the fort to the ships, playing "a somewhat inglorious part" as described by Holwell; "Messrs. M- & Frankland, the first Colonel and the other Lieutenant-Colonel of the Militia, Conducted the Ladies on board, and I understood were to return when they had reconciled the Ladies to their Situation, but they never returned again "[4].
1757, responsible for the supply of building materials and bricklayers to the engineers on the new Ft. William.
1758, sixth Member of Council, and Import Warehousekeeper. Appd. to survey the 24-Parganas which had just been assigned to the Company, and submitted the first revenue survey made by servant of the Company [13, 135–6].
His Garden House became the Loretto Convent now in Middleton Row[5].
Between 1758 and 1760, spent two years travelling home overland by way of the Persian Gulf. From Baghdād he crossed the desert to Palestine in the guise of a "Tarter messenger", and then sailed to Constantinople.
"Returned to England and purchased Muntham, Sussex; M P. for Thirsk York, 1768; Sheriff of Sussex 1782. ... Spent his later years in seclusion & study; much interested in mechanical experiment, for which he had an elaborate equipment at Muntham "[6].

FRASER, Thomas. Mad. Engrs.
b. *c.* 5–7–76. d. 15–3–1823, Bath.

Ens. 2–1–96 ... Capt. 14–7–1808; Ret. 1–3–1819.
Son of Hugh Fraser, of Morpeth, portrait painter.
m., 29–11–1810, Ann, dau. of Richard Sewell, & widow of Henry Brown, Mad. Civ.
Sometime a Lieut. in H M's 8th Brit. Fencibles.
1799, Adj. of Engrs. at siege of Seringapatam; Engr. & Survr. to Read's Dett.[7].
June 1799, Appd. to survey duties under Mackenzie: survd. Island of Seringapatam [118]; after a few months returned to Madras on the sick list[8].

GARDINER, Thomas. Ben. Engrs.

Ens. 16–9–67 ... Maj. 25–7–81; Resd. 22–1–84.
Hodson.
1767, in campaign against Nizām, survd. march of Peach's dett., Ellore to Warangal, [92, 115, 170].
The artist, William Hodges, stayed with him at Chunār in 1783[9].

GEILS, Thomas. Mad. Art.
b. *c.* 1746. d. 24–10–1815.

Lt. Fwkr. 26–10–67 ... Maj Gen. 3–5–96;
Ret. 31–1–1805.
Son of Andrew Geils.
m., Madras, 3–2–73, Miss Mary Pascal.
1768, During Mysore War acted as Fd. Engr., there being no engr. with the army. 1774, Senior Qmr. on the Coast; acted as DQMG. during siege of Tanjore. 1774, Appd. to comd. the Company of Guides, and to carry out survey of the Carnatic, but the Nawāb objected to survey, and after correspondence lasting over a year, proposal was abandoned [90–1].

GERARD, John. Ben. Inf.
b. 1765. d. 17–4–1824.

Ens. 15–1–83 ... Capt. 30–9–1803; Ret. 22–1–1808
Hodson.
Will, dated Tours, France, 3–11–1820, describes him "of Rochsoles, Edinburgh", and refers to his wife, Mrs. Dorothea Montague Alison or Gerard, to whom he left "his sugar Plantations, known as Belvue, in the Island of St. Vincent, and property in the shire of Lanark"[10]. Left two sons, Archibald and John, and a daughter Dorothea Jane. Uncle to the survr. Alexander Gerard (1792–1839).
1793, Survd. route of Kirkpatrick's mission to Nepāl [75]. Afterwards AG. Bengal.

GILCHRIST, John Borthwick. Ben. Med.
b. 1759. d. 9–1–1841, Paris.

Asst. Surg. Feb. 1782; Surg. 21–10–94; Ret. 6–1–1809.
LLD. Edinburgh, 1804.
DNB.; DIB.; Crawford.
To India as Asst. Surg. RN.
Employed on philological work nearly the whole of his service. Author of an *English–Hindostani Dictionary*, pub. Calcutta, 1787–90. A later edn. was adv. as, "*Gilchrist's Hindoostanee Dictionary & Grammer*, by John Gilchrist, Russapugla, near Calcutta, with his system of Hindoostanee Philology. He intends to proceed to Europe in Jan. 1797"[11].
1800, Appd. Head of Ft. William College on its foundation; took furl. to Europe, Feb. 1804, and did not return to India.
1818–26, Professor of Hindustani to EIC. in London.

His "System of Orthography of Indian names" was more generally used than the more orthodox system of Sir William Jones, and was followed in the Revenue Survey Dept. until the universal introduction of Dr Hunter's system in 1870 [249–60].

GOLDINGHAM, John. Astronomer.
d. 1849.

15–1–88, Appd. asst. to Topping for astr. obsns.; 5–2–96, Astronomer & Marine Surveyor; 6–2–1805, Leave to England; 31–1–1812, Resumed appt. in Madras; Ret. 1830.

[1] CM. 8–8–70. [2] *Twelve Indian Statesmen* (7). George Smith. 1927. [3] Leckie (1–50); Wills (86–116). [4] Letter to Bom. Council 17–7–56, HMS. 92 (260), 804 (363): cf. HMS. 192 (40–5); & Grose II (242). [5] Wilson, C. R., 5–1–61. [6] Holzman (71, 77, 143). [7] Vibart (327). [8] Govt. letter of 13–6–99 & MMC. 29–4–1800. [9] Hodges (53). [10] Ben Wills. 1827. [11] *CG.* 26–5–96.

Native of Denmark.

m., 1st, Madras, 20–4–96, Louisa Maria Popham; their son, John, bapt. Ft. St. George, 22–10–1801, entered Mad. Civ. 21–7–1820; another son, b. Madras, 11–1–1805, joined Mad. Art.

m., 2nd, Madras, 20–2–1815, Miss A. Baxter, by whom a son and 2 daus. were born.

1786, Arrd. Madras from England.

MPC. 15–1–88, appd. Asst. to Topping, salary 15 pagodas a month, on following recommendation; "A young Gentleman Mr. John Goldingham, who has had a regular mathematical education, and who is in every way qualified for the trust, I would beg leave to recommend. ... Mr. Goldingham has assisted, for several months past, in making many astronomical observations at a private observatory lately erected by William Petrie Esq. [6, 171]".

Jan. 1789, permitted to resign and proceed to England [171]; returned 1791, landing at Bombay where he fixed position by astr. obsns. [177, 181]. His salary was now raised to 50 pagodas a month.

1792–3, whilst observatory was being built, he survd. the coast northwards from Madras as far as mouths of the Kistna [4, 103, 104–5, 178, 192].

1794, appd. Supt. of the Surveying School [174,199].

Jan. 1796, succeeded as Astronomer and Marine Surveyor [173 n. 7, 174, 180–1], and the following year further appd. Inspector of Revenue Surveys [109, 145, 146, 194–5].

Had some knowledge of building construction, and in June 1799, was sent to Vellore to superintend repair of buildings to accommodate the family of Tipu Sultān, and under MPC. 19–3–1800 was appd. Civil Engineer in charge of all buildings at the Presidency town.

"The Right Hon'ble the Governor in Council, having considered the very defective mode of executing at present the erection & repair of the public buildings at this Presidency, has been pleased to supersede it entirely, and to establish a separate office of Civil Engineer. ...

"The Governor in Council, being induced to form an opinion of your integrity, not less sanguine than he is justified in entertaining of the zeal & science which you have manifested in the execution of the buildings and repairs entrusted to you, has been pleased to appoint you to be Civil Engineer at the Presidency, and to order that the repair & erection of all the Company's buildings at the Presidency, Civil & Military, shall be entrusted to your execution & Superintendence, from the 1st of May next. ...

"His Lordship permits you to draw the usual commission of fifteen per cent on the amount of all bill for building and repair, on the certificate of your honor that you derive no other advantage; and application will be made to the Court of Directors for two plain builders of sufficient knowledge in the practical part of the business of building to be employed under the Civil Engineer" [1].

This appt. did not meet with the approval of the Directors, and in Sept. 1801 the Chief Engineer was ordered to resume control of all buildings and works. In 1804 it was reported that Goldingham had drawn commission as Civil Engineer amounting to a total of Pagodas 22,507, excluding that drawn for the buildings at Vellore [2].

GOMONDE, Richard. Mad. Inf.
b. 1752–3. d. before 1812.

Ens. 17–6–78 ... Maj. 19–5–98; Ret. March. 1800.

m., Madras, 13–9–89, Miss Susannah Elleker; left 2 sons; Richard James, Mad. Art.; and Edward Thomas, Mad. Civ.

Dec. 1779, Acted as Asst. Engr., Tanjore; 1781–2, Fort Adj. Fort St. George; Aug. 1781 to Jan. 1782, Survd. various marches of Sir Eyre Coote, with appt. of Asst. Engr. [3].

GUTHRIE, John. Ben. Inf.
b. 6–3–49. d. 18–10–1803, at Fatehgarh, of wound received 30th September.

Ens. 15–3–73 ... Lt Col. 21–4–1800.

Son of Hugh Guthrie, of Kilmarrock.

Hodson.

1789, visited Garhwāl with the artists Thomas & William Daniel, and fixed the position of Srinagar by compass and perambulator [73].

HARDWICKE, Thomas. Ben. Art.
b. *c.* 1756. d. 3–3–1835.

Fwkr. 10–9–78..MajGen. 12–8–1819.

Distinguished botanist.

EIMC. I. (178–9); Hodson.

1796, starting from Fatehgarh with Dr. Hunter [340], proceeded alone from Anūpshahr to Hardwār, and then from Najibābād across the hills to Srinagar in Garhwāl, arriving 29–4–96. Left interesting journal, with description of the upper Ganges and snowy range.

A plot of his route and sketch of the Ganges is preserved in Calcutta [77–8]. He was not a surveyor, and the plot bears a note by Colebrooke, "It is impossible that in this mountainous Country a Day's Journey should amount to 12 Coss".

HARVEY, Henry. Ben. Inf.
bapt. 1–6–47. d. 1810–11.

Ens. 3–2–69 ... Capt. 13–10–78; Resd. 5–1–84.

Son of Rev. Amrose Harvey & Elizabeth his wife.

Hodson.

Amongst maps in Orme's possession in 1770 was a survey of the W. part of Monghyr by Lieut. "Harvey"; no other officer seems to fit [4].

1773, with John Jones [qv] at action "Delamcotta".

HAVILLAND. See DE HAVILLAND.

HAYWOOD, John James. RN.
b. *c.* 1773. d. 10–12–98 [5].

Midshipman, 20–6–96. Asst. to SG. 5–11–98.

SG. recommended appt. thus;

"I take the liberty of recommending to the notice of Government a young man of the name of J. Haywood, now a midshipman belonging to HMS. La Sybille, who, having long been afflicted with sickness and the hardships incident to a sea life, has, with the concurrence of his commanding officer, Capt. Cooke, determined on leaving the service. ... Mr. Haywood was sent on a voyage of discovery on board HMS. Providence, in the course of which he assisted in a survey of the NW. coast of America and California, but coming afterwards to Japan, the Providence was unfortunately wrecked near that island, when Capt. Broughton and the crew saved in a small tender of the same name, in which they arrived at Canton, and proceeded from thence to Trincomalee.

"Mr. Haywood was at that place sent on board the Sybille in a bad state of health, owing to the hardships he had undergone, but his principal reason for leaving the Navy is that he has been, with little intermission, afflicted with the scurvy ever since he took to the sea. He now lies sick at the General Hospital, where he is well taken care of, and in a fair way of recovery, but the medical gentlemen, I understand, have declared that he will be liable to a relapse should he again go to sea, and be put on a salt diet. ...

[1] MPC. 19–3–00. [2] Pers. Rec. IV (136). [3] DDn. 246 (147) [4] Orme MSS. 67, & Extracts (4999). [5] Admiralty Records; PRO. 13497.

"As Mr. Haywood appears to possess in an eminent degree the scientific knowledge and qualifications requisite for a Surveyor, and is otherwise recommended by his Captain, as a young man of excellent character, his appointment is strongly recommended"[1].

His appt. was sanctioned but he died the following month [271, 278].

HEATH, Robert Tyrrell. Bom. Inf.
b. *c.* 1764. d. 1–10–1813, Bombay, MI.

Lieut. 11–3–81 ... Col. 4–6–1813.

m., Bombay, 9–6–92, Miss Ann Hinton; left a son Henry (1794–1818) who became Lieut. Bom. Inf.

Bo. MC. 3–7–92, Asst. Survr. with Emmitt from April to July 1791 [129].

HEMMONNEAU, André. Draughtsman.
d. 31–12–99, Calcutta.

Son of Joaquim Hemmoneau and Frances Castello, of Pondicherry, and half-brother to Jean Boisseau [236].

m., Calcutta, Maria, dau. of Ferdinando Despontnior, and Maria George Panigier, of Calcutta.

In CE's. office, Madras, from 1773 till moved to Bengal in 1781, and served in SGO. till granted pension in July 1798 [236, 237]. Govt. refused an application to continue this pension to his widow.

HIRST, the Rev. William. Ben. Chpn.
d. 1770; lost at sea.

Junior Chpn. 18–3–62; Resd. 26–11–64.

Son of Rev. Wm. Hirst, D D., Master of Hertford Free School; Vicar of Benges & Rector of Sacomb, Hertford.

BA., Peterhouse, Cambridge, 1750; M A. 1754; F R S. 14–11–54.

DNB.; *DIB.*; Hyde (71, 127).

Chpn. RN. to Adm. Cornish; arrd. East Indies and present at siege of Pondicherry 1760–1. Whilst staying at Govt. House, Madras, obsd. transit of Venus 6–6–61 [153, 169, 200].

Returned to Europe with Governor Vansittart, sailing, Calcutta, 26–11–64.

His astr. obsns. used in compilation of Dunn's map of Bengal [222]. Amongst surveys taken home to Orme by Vansittart was a "map of the River Samelpore, laid down by Mr. Hirst"[2].

Returning to India with Vansittart and Francis Forde on board the *Aurora*, sailed from Cape of Good Hope 27–12–69, and never heard of again.

HOARE, James Griffith. Ben. Inf.
d. 9–8–98, Barrackpore, unm.

Ens. 15–1–83 ... Bt. Capt. 7–1–96.

Hodson.

May 1794, appd. 3rd. Asst. to SG. [271][3].

1794–5, Survd. a possible connection between the Ganges and Hooghly [63].

Survd. Jumna R. from Allahābād to Delhi [8, 57] reaching Agra by the end of June 1796, and remaining there several months [168, 188, 300].

On his complaint that he was not receiving allowances regularly, SG. pointed out that this was because he had not sent in monthly copies of his fdbks. [196-7], and reported to Govt., 10–3–97, that "Nothing material has been received at this office from Lieut. Hoare, who was deputed near two years since on a survey of the Jumna River, and that this officer has not in any adequate degree fulfilled the orders of Government, or my instructions, having been upwards of 8 months at Agra, where he has been detained partly by sickness and other causes, there appears to be little hope remaining that he would ever accomplish the object of his deputation, I beg leave therefore...to recommend that he be immediately recalled"[4].

To Hoare he wrote, "The plea of sickness which you have urged could not exonerate you from this part of your duty, particularly as it appears by your letters, most of which are written in a fair and legible hand, that you have never been totally incapacitated from writing"[5]. Hoare carried his survey on to Delhi, and was then recalled.

His plea of sickness was obviously genuine, for he died the following year, being buried at S. Park St. Cem. (MI).

He had made his will two years before at Agra; "Being this day severely bit by a small dog, and at present uncertain of its actual state of health, I am induced to make such preparations in time. ...

"Let the Horse I purchased from Mr. Treeves be offered to him again, as I have no other mode of paying him, and beg his forgiveness for me. I was much deceived in the horse"[6].

His fdbks. are preserved, and contain several neat and artistic little pen-and-ink sketches[7]; his maps are preserved in Calcutta[8].

Wilford quotes Hoare as authority for some Hindu legend; "This information was procured, at my request, by the late Lieutenant Hoare, who was remarkably fond of enquiries of that sort; and to whom I am indebted for several curious historical anecdotes...relating to the geography of the Gangetic Provinces"[9].

HOISSARD, George Isaac. Mad. Civ.
bapt. 18–10–54. Lisbon. d. 1791.

Writer, 1771 ... Senior Merch. 1782.

Eldest son of Daniel & Susannah Hoissard.

1790, Asst. to Resdt. at Nagore, residing at Negapatam; Survd. lands of Negapatam and Nagore, a survey which, being "very erroneous" as regards relative positions of principal towns, Goldingham recompiled on Topping's survey of coast-line [103].

Will, sd. on board ship in Point de Galle Harbour, 12–11–90, describes him as "lately resident of Nagore"[10].

HOWE, the Hon. Thomas. Mar. Service, EIC.
d. 14–11–71.

Sworn 2nd Mate, 11–10–54; Comdr. 29–6–57.

4th son of Emanuel Scrope Howe, 2nd Viscount Howe (Debrett, 1803).

19–12–54, Sailed in *Rhoda*; arrd. Madras 9–6–55; obsd. long. of Madras 5–7–55 [169]; sailed for China 18–7–55[11].

30–12–57, Appd. Comdr. of *Winchelsea*; April 1759, sailed from Madras with Dalrymple as passenger for Borneo and Sulu Is. [183, 330]; sailed again from England 15–3–62, losing ship at mouth of the Hooghly 20–3–64.

[1] DDn. 16 (94), 30–10–98. [2] Orme MSS. 134. [3] BMC. 19–5–94 (28). [4] DDn. 14 (16). [5] DDn. 14 (28), 28–3–97. [6] Ben. Wills. 1798–9. [7] GBO. Lib. M481. [8] MRIO. 160 (53–5). [9] *As R.* IX (39–40). [10] Mad. Wills. 1791. pr. 8–2–92. [11] CM. 11–10–54; MPC. & IO. Logs. vol. 596 D.

16–3–66, Appd. Comdr. of *Nottingham*; arrd. England 26–11–67; Dismd. 4–5–68, with other Comdrs., for illicitly carrying warlike stores; Restored 1769[1].

CM. 11–7–70, Directors record letter "from Mr. Alexander Dalrymple [330]...representing his willingness to go in joint Commission with the Honble Mr. Howe to effect an establishment at Balambangan, and that he is authorised to say Mr. Howe will on all occasions be ready to render any service in his power to the Company".

Many astr. obsn. and charts recorded by Dalrymple, particularly a survey of Orissa coast and chart of Bay of Bengal, 1763 [15]. In one of his printed papers Dalrymple regrets the loss of a compass given him by Howe.

Astr. obsns. at various places along the coast used by Rennell and others; long. Ft. St. George, 5–7–55 [169, 180]; lat. & long. Calcutta, March 1764 [153], and obsns. at Bombay [123, 176].

Rennell acknowledges the use of "a MS. chart compiled by the late Mr. Howe" for the Tenassarim coast from Tavai point to Mergui"[2].

1767, Col. Richard Smith sent maps and drawings home to Orme from Calcutta "by the hand of Capt. Howe [29, 111]"[3].

HUDDART, Joseph. Mar. Service, EIC.
b. 11–1–41. d. 19–8–1816.

4th Mate, Dec. 1773; Comdr. April 1778; Ret. 1788.
Son of a fish-curer of Allonby, Cumberland.
m., 1761, Elizabeth, dau. of John Johnston, and left 2 sons, both in service of EIC.
1791, Elder Brother of Trinity House, and FRS.
DNB.; Burke's *History of the Commoners*, 1837.

April, 1778, Comdr. of the *Royal Admiral*; before April 1778, made a series of obsns. for lat. and long. between Bombay & Mount Dilli on Malabar coast [123, 129, 176, 178, 203].

Obsd. long. of Canton, China [181].

HUMPHRAYS[4], Richard. Ben. Engrs.
b. 28–1–62. d. 14–4–1806, Allahābād.

Ens. 2–10–78 ... Bt. Lt Col. 1–1–1800.
3rd son of Charles Gardiner Humphrays, of Bank House Montgomery.
m., Calcutta, 4–2–86, Margaret Ursula, dau. of Thomas Kearnan of Ben. Inf.
Blunt; Hodson.

BRC. 14–6–82, Appd. Asst. Survr. under Collector of Bhāgalpur, and apparently with Pearse on his return from leave down east coast [155 n. 7], for Pearse records that at Masulipatam, 1–11–82, "Lieutenant Humphrys observed with a sextant", taking latitudes[5].

July 1787, Asst. Engr. Budge Budge; 1793, Engr. at Dinapore; 1806, Comdg. at Allahābād.

BPC. 14–3–1800 (138); Examined Dr. Dinwiddie's instruments, purchased in Calcutta for Lambton's survey; "Captain Humphrys in particular has examined them with much attention, and he is a good judge of such instruments" [*inf.*].

Bur. Kydganj Cem., Allahābād; MI.

HUNTER, William. Ben. Med.
b. 1755. d. 16–12–1813, Batavia, in Java.

Asst. Surg. 4–3–82; Surg. 21–10–94.
Had a bro., Rev. Charles Hunter, and house property, in Edinburgh.
m. Charlotte, who d. Calcutta 9-12-1808, and had three daus. one of whom, Elizabeth, m., 2–2–1811, John Ramsay, Ben. Inf.
M A. 1777; M D. 1805; of Mareschal Coll., Aberdeen[6].
DNB.; *DIB.*
1785, pub. *Concise Account of the Kingdom of Pegu.*

1790, appd. Surg. to Resdt. with Sindhia and, 1792 survd. route from Fategarh to Ujjain[7]; Resdt. writes, 21–12–92, from "Ogeine. An epidemical fever has prevailed here ever since the Rains, and few persons in my camp have escaped it; Mr. Hunter the Surgeon has, for several days past, been in a very deplorable situation, but I am more apprehensive for the loss of his reason, than of his life"[8].

Made a good recovery and during the next four years made surveys of Sindhia's marches, taking frequent astr. obsns., through a country of which there was little accurate knowledge [56, 168, 232].

March 1796, with Thomas Hardwicke from Fatehgarh to Anupshahr, running a perambulator traverse, and visiting several Indigo plantations. Hardwicke expressed regret that Hunter could not have accompanied him to Garhwāl [338] for "the Public would have obtained much important information from the labours of a person of Mr. Hunter's abilities & intimate knowledge of every branch of natural philosophy"[9].

1800, on committee inspecting instruments purchased from Dinwiddie for Lambton's survey [*sup.*].

1807, Presidency Surg., Calcutta.

1798–1811, Sec. Asiatic Soc. at Calcutta; Asst. to Professor of Hindustani [250], also Sec. and Librarian, at Ft. William College from 1805. Pub. *Hindustani–English Dictionary* 1808.
Supt. Surg., Java, 1811 till death.

HUYGENS[10], Henry. Ben. Engrs.

2nd Lieut. 11–10–62 ... Capt. 25–3–65.
Hodson.
A Dutch Huygens "devised a pendulum clock in 1656".
Oct. 1762, Appd. Sub-Engr. under Polier [qv], on works at Ft. William.
Oct. 1763, Engr. at Berhampore[11].

1765, survd. Ganges, Allahābād to Kanoge, and Allahābād to Benares[12] [21, 225].

1766, Feb., Survd. the Ganges; Benares to Patna[13]; with 3rd Brigade during "Batta" mutiny, but did not take part.

From Oct., Survd. the passes thro' Rājmahāl Hills and to south [25, 33, 225, 269].

HYDE, William. Ben. Inf.
d. 21–10–87, Cawnpore, unm.

Ens. 20–2–69 ... Capt. 28–1–79.
Son of Mary Hyde; had an uncle, Thomas Lewise, of Tottenham High Cross, Middlesex; also a bro. David.
Hodson.

[1] Mar. Rec. Misc. 651 (4) & CM. [2] *Memoir*, 1793 (40). [3] Orme MSS. 41 (19). [4] Many variations of spelling. [5] *As R.* 1. 1784 (87) [6] Crawford. [7] Narrative, *As AR.* 1800 (277–316). [8] B. Pol. C. 21–12–92, (12). [9] Hardwick's journal, MRIO. M. 349, 23–3–96: cf. *As. R.* vi. 1799 (309–81). [10] Sometimes Huggens or Huggins. [11] BM. Addl. MSS. 6049 (24). [12] Orme MSS. 65 (30). [13] MRIO. 167 (9).

March 1779 to May 1780, acting Fd. Engr. with 1st. Bri. at Cawnpore, survd. Jumna R. from Etāwah to Allahābād; maps beautifully drawn, with copious notes of military interest [38].

Aug. 1781, stationed at Kālpi; Dec. 1786 to March 1787, made other surveys along Jumna.

IRELAND, Thomas. Bom. Art.
b. *c.* 1767. d. 6–2–93, in India.

Fwkr. 1–3–87.

Oct. 1791 to March 1792, Survd. route from Mangla to Dharwār with Little's Dett. [128]; classed as "valuable survey" by Jopp, 1832[1].

IRONSIDE, Gilbert. Ben. Inf.
b. 12–12–37. d. 7–10–1802.

Ens. 14–12–58 ... Lt Col. 2–4–68.

Son of Edward Ironside, of Twickenham, banker, Lord Mayor.

Hodson.

24–9–60, Commy. & Judge Advocate to the army; 8–7–62, Town Major, Ft. William; 27–4–62, Report on Monghyr Fort.

Sent Orme a journal of Maj. Adams' march Patna to Gaurhāti (or Girheti), near Calcutta, via "the Bihar Passes"; also list of stages all through Bengal, with geographical descriptions of provinces and districts, and routes in the Upper Provinces[2].

1767, Rennell used his values for lats. of Calcutta, Burdwān, and Malda; also information about march from "Hodgepore to Bettyah", and, in later maps, the "road from Serampour to Ayturah"[3].

IRWIN, Eyles. Mad. Civ.
bapt. 23–2–51, Calcutta. d. 12–8–1817.

Writer 22–10–66 ... Senior Merch. 1778; Ret. 1794.

Son of Capt. James Irwin, of Ben. Council and Roscommon, Ireland, & Sarah his wife.

m., 1778, Honor, dau. of Rev. Wm. Brooke of co. Longford.

DNB.; Holzman (147).

20–9–71. Appd. to survey Blacktown, Madras; 23–9–71, Appd. "Superintendent of the Lands...belonging to the Town of Madras, St. Thomé, Chipauk, and environs"; 1–4–76, submitted survey of Blacktown; 10–12–76, appt. abolished [94, 290].

1776, with Dalrymple supported Lord Pigot against his Council [256 n. 6]; sent home, but reinstated later; pub. account of journey home via Red Sea, possibly with Dalrymple [330][4].

1780–85, again in India; 1792, on mission to China.

Wrote verse; portrait by Romney.

JACKSON, James. Bom. Art.
d. 1783, in Mysore.

Fwkr., 31–7–71 ... 2nd Capt. 14–2–79.

April 1783, taken prisoner at Bednur [125], and d. in captivity.

Survd. in N. Konkan and, 1779, detailed to assist in survey of Broach [122].

JENNINGS, William. Mad. & Ben. Art.
b. 1718–19. d. March 1766, in Bengal.

Fwkr. (Mad.) 15–6–54; tr. to Ben. Est. 1757 ... Maj. 11–12–65.

Son of Joseph & Mary Jennings of High Wycombe.

m. Harriot —.

Ed. RMA. with Knox [qv], probably 1750–2[5].

Hodson.

1755, Survd. marches of Heron's force from Trichinopoly to Madura & Tinnivelly, and country round Madura [87, 271].

With Clive to Bengal at the end of 1756, with Art. from Madras[6], succeeding to comd. the Ben. Company of Art. as Capt., 29–6–57.

Comdg. Ben. army at Sawaut, near Karamnāsa R. [24 n. 7], Feb. 1764, when the Eur. contingent mutinied. "The exertions of Jennings & of Lt. Claud Martin" [qv] prevented more than a small number deserting into Oudh[7].

23–10–64, Comdg. Art. at battle of Buxar, before which had been employed with Nicol [qv] on survey of battlefield.

JOHNSON, John. Bom. Engrs.
d. 11–2–1846.

Ens. 31–5–85 ... Bt. Lt Col. 4–6–1814; Ret. 15–8–1819.

m. Diderica Memeling. CB. 4–6–1815.

EIMC. I (220).

Nov. 1790, with Frederick's force to Dhārwār as Asst. Survr. and after fall of Dhārwār survd. return route of the dett. via Poona [128-9].

Joined Bom. army in Malabar and, Jan. 1792, survd. route into Mysore [131] and various routes round Seringapatam [113]. March 1792, joined Marātha army, making surveys on march back to Bombay.

Mentioned by Moor more than once; "A party of about 300 Beydars now made their appearance, when 500 Mahrattas mounted and vowed vengeance upon them; to encourage them, Lieut. Johnson put himself at their head, and they charged to within 100 yards of the Beydars. ...

"Mr. Cruso [126] had the misfortune to break his arm, which at this time was peculiarly unlucky, as his utmost exertions were required with the hospital department. ... Rice this evening in the bazar was three Rupees per seer. ...

"On the 19th the Army marched, and were, as usual, pestered by the Beydars, on whom a gun or two was opened in the rear. ... Make the best of our way to Hurry Hal. ...[8]

"On 4th of May the sick and wounded, with the heavy baggage of our party, proceeded to Goa; ... Lt. Johnson also went to survey another route to Goa, and thence to Poona, by way of Tajgom and Meritch"[9].

At the end of 1792, sent with Emmitt to survey boundaries of Malabar, and remained in that province till the 4th Mysore war [7, 130, 131, 298]. 1795, on engr. duties at siege of Cochin, and at end of 1798 on works at Palghāt. 1–12–96, Report on gunroads through Malabar[10].

1799, Survd. route of Bombay army to the siege of Seringapatam [118], and there employed on the north batteries under Mackenzie [351].

1800 and 1801, on survey and engr. duties in N. Canara and Dhārwār, and the following year in charge of defence works at Haliyāl in which Wellesley was much interested[11].

JOHNSTON, James. Mad. Engrs.
d. 26–2–93, Edinburgh.

Ens. 18–4–74 ... Maj. 26–9–83; on halfpay to Europe, 4–7–89.

m., 10–11–92, Margaret, eldest dau. of John Blair, of Balthayock, co. Perth.

[1] DDn. 235(20), 3–5–1832. [2] Orme MSS. 67. [3] Hājīpur, 72 G/2; Bettiah 72 B/5. IO Maps. I. AC. 13. [4] *A Series of Adventures in the Course of a voyage up the Red Sea. 1777.* London. 2 vols. 1780–1. 3rd Edn. 1787. [5] S. C. Hill (44). [6] cf. Robert Barker (311). [7] Stubbs. I (26). [8] Haliyāl, 48 I/15. [9] Mirāj, 47 L/9. Moor (224, 226–7, 255). [10] Logan (64). [11] *Supply. Desps.* III. 27–10–1800 & 29–6–1802.

1773, Asst. Survr. with Pittman to Vizagapatam as a cadet, being allowed Ensign's pay and Batta [3, 92-3, 143, 272, 279,]. After Pittman's death continued survey until, in Jan. 1777, it became "necessary to remove Lieut. Johnstone from the Northward on account of the repeated indisposition he has had during the Course of his Survey for the last three years; and that he may have an opportunity of improving himself in other branches of his profession" [1].

1778, Wounded at siege of Pondicherry, and then placed in charge of works at Tanjore. Selected for comd. of Pioneers on expn. to Mahè the following year, but "declared by the doctors...to be in too ill a state of health to think of proceeding", and in Dec. was "yet so much affected by the wound he received, that he is incapable of using much exercise" [2].

1782, Engr. at Negapatam [103 n. 1]; 1788, Senior Engr. with force which occupied Guntūr [111] and, 1789, after selling his survg. instruments to Govt., permitted to return to Europe via China.

JONES, John. Ben. Inf.
d. 24–5–73, Cooch Behār.

Lieut. 2–11–64; Capt. 27–5–67.
DIB. Hodson.

Survd. routes in Oudh & Rohilkhand; constructed "Map of the Centre of Indoostan", Allahābād to Delhi [222].

"In 1768, that excellent officer, Captain John Jones, got command of of it [6th Batt. of Sepoys]; ... then at Allahabad, from whence it marched to Dinapore the latter end of the following year, where it remained until January 1771, when the whole brigade moved up to the Carumnassa. ...

"In the latter end of...[1772], the Bootias...having overrun the province of Cooss Behar, this battalion was ordered to clear it. ... In April at the storm of Delamcotta, one of the strongest forts in that district, a detachment...gained great honour. In advancing to the breach...the colour-man was killed, when the standard fell and the men seemed to recoil; which being perceived by the late Mr. Harvey [338], then a Lieutenant in the battalion, he took it up and advanced to the breach, followed by his men, who were soon masters of the place" [3].

Plate XVIII of Rennell's *Bengal Atlas* gives a view of Dellamcottah Ft., Bhutān, "inscribed to the memory of that brave and excellent officer, Capt. John Jones, who took it by assault on April 1773, and soon after fell a sacrifice to the unwholesome climate of Coos Beyhar [229]".

JONES, William. Judge of High Court, Ben.
b. 28–9–46. d. 27–4–94, Calcutta.

3rd son of William Jones, mathematician, *DNB.*, and Mary, his wife.

Ed. Harrow, 1753–63.

m., 1783, A— M—, dau. of Dr. Shipley, Bishop of St. Asaph.

FRS. 1772; Kt. 19–3–83; MI. in St. Paul's Cathedral, Calcutta; portraits & bust. RASB. Calcutta.

DNB.; DIB.; Teignmouth.

Called to Bar, 1774; reputation as scholar and writer in England.

1783, Appd. Judge of High Court, Calcutta, his great interest in the Sanscrit language being chief reason for accepting appt.

Sailed for India April 1783. Founded Asiatic Soc. of Bengal 1784, his first presidential address being on the subject of orthography [4].

"During his residence at Calcutta he tried to solve one of the chief difficulties of translations of Oriental Classics into European Languages" by his system of orthography. This system stood for the next 80 years as rival to that of Dr. Gilchrist [qv] [249-50].

Much interested in height of Himālayan peaks [77, 332] and Burrow's survey [165, 319].

Besides a *Memoir* on his life and writings, Lord Teignmouth edited "*The Works of Sir William Jones 1807*".

KELLY, Robert. Mad. Inf.
b. 1738. d. 24–9–90, killed in duel at Arni [5].

Ens. 6–10–60 ... Col. 8–11–85.

Nephew of John Barr, of Monaghan in Ulster, who left him land.

m. (?) Miriam —, who gave him 3 sons, Robert, George, and Hastings Montague, and 1 dau. [344].

1764, At blockade of Madura and capture of the fort of Verdagherry [6].

1766–7, Stationed at Masulipatam and, having been often employed on engr. duties, was given charge of defence works at Masulipatam, Ellore, and other places. Survd. roads leading to Ellore and along "the Frontiers of Elour and Mustaphanagar Circars" [7].

12–10–67, Reported from Samalcotah [8] that "much of the work has been washed away by the excessive rains. ... Just at this juncture, Gentlemen, I was seized with a violent disorder which has continued on me ever since, with very little intermission, and which I have great reason to think has been another unfortunate cause of the backwardness of the work, ... for had I been always present, and able to oversee the works, I am certain there would have not only been more done, ... but better done" [9].

27–11–67, Appd. to comd. a company in the Eur. Batt., but the following year, writes the Council, "as field Engineers are much wanted with the army under Col. Smith [10], we have ordered Capt. Kelly to return & join him" [11].

At the end of 1768, left in comd. of fort at Kolār [12], and the following March reported that he had beaten off several attacks. Peace was declared the next month, but Kelly was now in trouble for having reported that Kolār could not hold out owing to shortage of provisions, whereas these proved sufficient to last till peace came. He was brought to ctml. and acquitted, but Govt. refused to accept the verdict; "they consider that Capt. Kelly wished to exaggerate his difficulties, so as to enhance his own merit; the Board therefore Dismiss Capt. Kelly from the Company's service. If he makes due apology they are prepared to reinstate him".

Kelly duly wrote "expressing his concern for his conduct and the justness of the Board's displeasure threat, and requesting to be restored to his rank in the Service", which was granted [13].

1770, to Trichinopoly with his company of Europeans, 38 strong, and ordered by the Governor to make a survey on the way, and to put up proposals for a general survey of the Carnatic. The scheme he put forward was not taken up, but from this time onward he lost no opportunity of making all the surveys he could [3, 89–90, 95].

[1] MMC. 6–1–77. [2] Mack MSS. LXVIII, 12–12–79. [3] Williams (107, 109). [4] *As R.* I. [5] 57 P/6. [6] Vibart. I (88). [7] MMC. 29–5–66. [8] Sāmalcot, 65 K/4. [9] MMC. 12–10–67. [10] 1st Mysore War [91]. [11] MMC. 11–7–68. [12] 57 K/4. [13] MMC. 10–7–69 to 28–12–69.

1-4-71, Appd. to comd. the 9th Batt. of Sepoys; 1775, his batt. was ordered to Bombay to take part in 1st war against the Marāthas [121]. He was ordered to "leave the field pieces of the battalion at Trichinopoly, and proceed to Palamcotah", and thence through Travancore to Anjengo[1] to embark for Bombay. Before reaching Pālamcottah he reported that his batt. objected to making the voyage by sea; "the glory of the 9th Battalion is now totally extinguished; ... on board ship they will not go"[2] [40].

The Board called for volunteers from other batts. to make up a unit in their place; but Kelly meantime had held a ctml., which decided that the "Black acting Commandant" was alone responsible for the mutiny, and, "as the exigency of the case required, in his opinion, the most exemplary and the most striking mode of inflicting the punishment, he had caused the Commandant to be blown from a gun, in the presence of the Battalion, which to the number of 900 men turned out voluntarily to witness the Execution; Capt. Kelly thinks he will have no occasion for any recruits, ... and, from the Behaviour of the Sepoys at the execution of the Commandant, he hopes that there will be few desertions..."; the Board commended the manner in which he handled the situation[3].

The march proceeded, and on March 5th Kelly was able to report, "I arrived at Anjengo with my stubborn Battalion at 7 o'clock this morning", and successfully embarked it the following day.

He wrote from Bombay 6-6-75, "I received orders to march to Salset, with 4 companies of my Sepoys, to repel the Mahrattas; ... this service being happily effected, was joined by the remainder of my Battalion; ... — commanded a mixed force watching the Mahrattas; ... — depth of the monsoon, remaining till 9th August. ...

"Returned to Bombay, hospitals crowded with our men. ... In October [1775] we marched to Salset again, and after 12 days returned to garrison duty at Bombay"[4].

He tells of murmurs among the men, and presses for double batta, which is eventually granted, and, 24-7-76, the Bombay Govt. advised Madras that they were sending him back with "the remainder of his Battalion. We mention with pleasure that Capt. Kelly's conduct whilst under our directions, and particularly in repelling the Mahratta invasion upon Salsette, has given us perfect satisfaction"[5].

1777, Kelly's batt. was ordered up to the hills of Chittoor[6], to operate against the *poligars*[7] on behalf of the Nawāb of Carnatic [257], but "after sustaining some loss was found unequal to the undertaking, and more Battalions and artillery had to be sent. On the force entering the Pollams by Shulangur, they [the *poligārs*] made their submission. ... When the detachment was withdrawn, Capt. Kelly was left with his Battalion to see order restored, who even in the hour of submission found it expedient for his security to entrench himself...near Gullia Pollam, where he remained several months and on retiring destroyed the works he had made"[8].

12-4-78, he wrote from Conjeeveram, "On the Arrival of my Battalion from Bombay in the beginning of 1776, it was ordered to canton in this village; ... there have never been any regular barracks. ... [We] put the temporary quarters into repair; ... just as we had rendered them a little comfortable, we were ordered to take the field against some troublesome Polygars in this neighbourhood; We kept the field about 8 months, & on our return to Cantonments, we found our quarters very much out of repair again. ... "The Board refused compensation as no estimate had been put up for previous sanction before the repairs were carried out[9].

June 1778, Granted leave to go to sea on account of health; asked permission to proceed to England, but changed his mind[10], and before the end of the year put up to Govt. proposals for a regular survey of the Carnatic, with an account of the surveys he had been carrying out on his own account since 1770 [89-90, 272]. He was asked to estimate the cost of his proposals, and worked out an establishment for a regular survey dept. [263]. Govt. found the scheme attractive, but could not face the expense without reference to the Directors, though in the meantime they gave Kelly the allowances of a major, with permission to do what survey he could by himself [97, 240, 280].

Whilst this scheme was under consideration, Kelly acted as CE. to an expn. sent to the west coast to capture the French settlement of Mahé, which surrendered without a siege, 14-3-79. He then spent several months on survey till, in June 1780, the whole Presidency was mobilised to resist the invasion of Haidar Ali [97]. Hector Munro assembled the army at Conjeeveram, and there awaited the arrival of Baillie's force from the north, a reinforcement necessary before he could engage Haidar Ali with confidence [40].

"The country round Conjeeveram [pl. 9] being extremely flat and woody, it was impossible to reconnoitre closely without cavalry; we therefore had no other means of Observing the movements of the enemy than from the top of an high pagoda in this city, in which a telescope was fixed entirely under the eye of Major Kelly, a vigilant officer, who engaged to communicate, by signals from this steeple, every motion of the Misore army with the greatest exactness; this indeed was an excellent expedient"[11].

This anxious watch was no avail, for Baillie's force was intercepted and destroyed on Sept. 10th [40].

Kelly was now ordered to join his batt. at Tanjore, and by Jan. 1783 was comdg. a bri. of 4 batts.

During the rains of 1781 and 1782 he took leave to Calcutta, and there addressed the G G in C. on the subject of his surveys, submitting a copy of his Atlas of the South Peninsula, probably the identical copy now preserved in S G O. [240-3; pls. 9, 15]. The Council granted him 30,000 *arcot* rupees [279 n. 1] but though they wrote home most pressingly to the Directors, the Court would not face the expense of a regular survey, nor did Kelly's request to be made "Geographer to the Company on the Coast" meet with any better success [263].

Haidar Ali d. Dec. 1782 and Sir Eyre Coote the following April [4]. The French, who had been supporting the Mysore cause, now received reinforcements under the veteran Bussy [320], but had to bear the brunt of the English attacks, for the operations of the Bombay army on the West coast had drawn Tipu away from the Carnatic [125]. Kelly with his 4th Bri. took a prominent part in the attack on Cuddalore, 13-6-83, but the siege was not pressed home after news arrived from England that peace had been signed.

Kelly now joined Fullarton's army and survd. its marches from Negapatam and Madura to Palghāt and Coimbatore, sending a copy of map with full report to the supreme Govt. [4, 98, 170, 178-9, 185].

After the conclusion of peace he set to work to complete his atlas in addition to his other military duties [242]. In June 1786 the Directors passed a copy of his map to Rennell, writting, "if Major Rennell will take the trouble of calling at India House, Mr. M. will be happy in submitting it to his inspection"[12].

[1] Pālamcottah, 58 H/14; Anjengo, 58 D/14. [2] MMC. 24-2-75. [3] MMC. 6-3-75. [4] MMC. 24-6-76. [5] MMC. 19-8-76. [6] 57 O/4. [7] Petty chiefs. [8] Mack MMS. LXV III, CE. to Govt. 20-5-84. [9] MMC. 22-4-78. [10] Probably because, July 1778, news reached India that war had broken out between England and France. [11] Munro (144). [12] IO Misc. 28 (661).

In these labours Kelly was at times helped by his eldest son Robert, who writes that he took with him to England about 1789 "a set of maps of the Carnatick compiled by the Colonel his father with vast expence, much labor, and great study, in which work your petitioner [Robert jr.] assisted in the intervals of his military occupations" [220][1].

1785, Kelly got regular comd. of the 4th Bri., and in 1788 was comdg. the troops at Walājābād[2]. On the outbreak of war with Tipu in 1790, the Madras Govt. received "a variety of intelligence concurring in announcing an intended invasion of the Carnatic by a very formidable Force of Horse and Foot. We have been compelled to issue orders for assembling in the field the greatest part of the Troops cantoned in the center Division. We have put the whole under the command of Col. Kelly, an officer of great experience and have entrusted him with the defence of the country" [312][3].

Kelly's responsibilities were very clearly defined; "the very heavy expence which will be incurred renders it necessary that every attention should be paid to oeconomy; ... he will keep this circumstance constantly in view, and be very cautious that his recommendations be liable to the least possible expence. ... Proper attention be paid to the security of Poonamalee, Tripasore, Conjeveram, and Carangooly, where there are considerable supplies of grain"[4].

There were endless preparations to be made before the army could be ready for action, and Kelly had to write to the CE., 20–9–90, "Why do you send us Engineers without Tools? Pray indent immediately for abundance of them"[5]. The public chafed at the delay, and the *Madras Courier* of Sept. 15th wrote;

"The Western Army remain in Camp near Arnee[6], panting with impatience for commencing their plan of operations and co-operating with the great force in the South, to the general object"[7].

Kelly's command was cut off by a shocking tragedy. He was killed in duel by a brother officer, Urban Vigors. There still existed at Arni up to some short time ago, "an imposing column, about 65 feet high, ... in the old parade ground in the Fort. ..." bearing the following inscription; "Robert Kelly. Sacred to the memory of Colonel Robert Kelly, who departed this life in the vicinity of Arnee, September 29th A.D. 1790, aet. 52. This monument was erected by Lieut. Colonel Urban Vigors as a mark of respect for a gallant soldier".—"Tradition says that on Col. Kelly's appointment to command, Vigors spoke of him as an 'old woman' to his wife, who repeated the remark to Mrs. Kelly, who insisted upon Kelly obtaining 'satisfaction'"[8].

Kelly is a striking instance of a zealous and practical surveyor who was at the same time a distinguished soldier; there is no doubt that if the Company had been in a position to spend the money on the regular survey he proposed, and if the Nawāb could have been persuaded to give his consent to it, Kelly would have been a most successful Surveyor General, but Madras had to wait 20 years after his death before such an office was created.

Nothing is known of his wife, Miriam, except that she d. at St. Thomas' Mount 28–5–1837; no record has been found of their marriage; on the other hand there is a letter amongst the Palk papers, 2–8–86, which mentions that "the natural son...of Col. Kelly" had arrived in India with commission as ensign[9].

Kelly had presented this son, Robert, to the C-in-C. in 1781 with a letter, "I think he has a Military genius, which I should be happy to cultivate, and will therefore esteem it a very particular favor if you will be pleased to recommend him...for admition as a minor cadet on the Bengal establishment"[10].

The younger Robert himself writes that he "was born in India, and at early age sent to Britain for his education, which designed him for the profession of Arms"; that "in the year 1782, he was nominated a minor cadet, in G.O. by the Governor & Council of Madrass, and returned to Madrass in 1784, and was appointed an Ensign [30–10–86] to do duty as Cornet of Cavalry. ... After three years service...was obliged to return to England, as well for the re-establishment of his health, as to present to your Hon'ble Court a set of Maps of the Carnatick. ... That your petitioner is with a Wife in a most destitute condition"[11].

On 25–7–90 Kelly had written to his executor forwarding his will, which he had "mutilated on account of the infamous ill behaviour of that undutiful boy. I could forgive his behaviour to me, but never shall pass over or forgive his ungrateful & undutiful conduct towards Lord Hawke, to whom he owed more than Filial duty and affection".

By the amended will he left, of "his property in India,
2/7ths, to my wife Myriam,
2/7ths to my daughter Myriam,
2/7ths to my son Hastings Montague,
1/7ths to my son George";
whilst he left land in Ireland to George.

Legacies previously made to Robert "now in England" were struck out, and further, "I do appoint my noble friend and benefactor Lord Martin Blanden, Lord Hawke[12], to be the Guardian of my daughter, in conjunction with my wife", and acknowledges "the kind patronage already experienced from his Lordship"[13]. It is not known how Kelly became acquainted with Lord Hawke, who lived in Yorkshire and never visited India.

Kelly's second son, George Robert Abraham, to whom the Irish estates were left, swore in his application for appt. as cadet, 13–12–90, that he was son of Colonel Robert Kelly, and believed that he was born at Ft. St. George in 1773 or 1774. He was appd. Lieut. of Mad. Inf. 22–2–93. ... Maj. 13–4–1813, and d. 29–5–1818; he m. 13–5–1809, Miss Macdowall, and is said also to have been father of Sir Fitzroy Kelly, b. 9–10–96[14].

The third son, Hastings Montague, became Ens., Mad. Inf., 24–7–98, and Col. 5–6–1829. He was made CB., and d. 14–2–1832, at sea.

In reporting Kelly's death, the Madras Govt. made no mention of the duel, contenting themselves by saying that he "departed this life after a few hours illness". The younger Robert refers to "the sudden and melancholy death of his father, cut off by treachery (being poisoned)".

KIRKPATRICK, William. Ben. Inf. b. 1754. d. 22–8–1812.

Ens. 17–1–73 ... Lt Col. 1–1–98; Left India 1801; Maj Gen. 4–6–1811.

Eldest son of Col. James Kirkpatrick, Mad. Est. and half-bro. to James Achilles Kirkpatrick (1764–1805) Mad. Est. (*DIB.*).

DNB.; *DIB.*; *EIMC.* II. (454); Hodson.

In granting permission for his return to India in Nov. 1784, the Directors asked the GG in C. to support his publication of a new *Grammar of the Hindoo Dialect*[15].

Rennell's map of the *Countries between Delhi and Candahar, including Cashmere and the Heads of the Indus* [233, pl. 8] included "3 measured routes leading into Cashmere from Lahore" and other material, collected by Kirkpatrick from the Imperial records at Delhi [10 n. 5, 42][16].

Feb. 1791, acting Judge Adv. Gen. at ctml. on Samuel Showers [qv].

[1] Misc LR. 89 (9). [2] 57 P/13. [3] B Pol C. 6–8–90. [4] B Pol C. 6–8–90. [5] Mack MSS. LXIX. [6] Arni, 57 P/6. [7] *CG.* 7–10–90. [8] Cotton (136). [9] *Palk MSS.* (406). [10] BPC. 12–11–81. [11] Petition, read 30–1–93; Misc LR. 89 (9). [12] Eldest son of Edward, 1st Baron Hawke; b. 20–4–44; succeeded as 2nd Baron, 17–10–81. [13] Mad. Wills. 1791. [14] Cadet Papers. Vol. 3. [15] CCor. 23–11–84. [16] *Memoir*, 1793 (xii, 65, 83) & MRIO. M 574, 27–6–95.

1793, Led mission to Nepāl, account pub. 1811, including map of route by John Gerard [8, 75, 78].

Nov. 1793, Appd. Resdt. at Hyderābād, and as such helped Mackenzie's geographical researches [116, 350].

1798–9, Mil. Sec. to GG.; 1801, Resdt. Poona.
1811, pub., London, *Select Letters of Tippoo Sultan.*
d. from taking laudanum in mistake for a black draught.

KNOX, Ranfurly[1]. Ben. Inf.

b. between 1730 & 1734 at Sligo.
d. 28–1–64, Patna, unm.; MI.

Ens. (Mad.) 6–7–54; tr. to Ben. est. Sept. 1758; ... Maj. Oct. 1763.

Son of John & Rebecca Knox; Nephew to Rev. George Knox of Dublin; bro. to Henry Knox, Vicar of Berkley, and to Lieut. John Knox; cousin to Capt. Mitchelburne Knox.
S. C. Hill; Hodson.

Ed. RMA.; arrd. Madras 6–7–54; to Bengal under Clive Oct. 1756, and obtained comd. of a batt. of sepoys[2]; present at battle of Plassey, a plan of which bears his signature.

1759, with expn. to Northern Circārs, distinguishing himself at siege of Masulipatam and other actions. Rennell acknowledges use of "a MS. map compiled during Col. Forde's expedition to Masulipatam in 1752" which, if not made by Knox, probably contained his work [91][3].

Forde's high opinion of Knox is expressed in the following letter to the Directors, dated 7–3–62, "Had I a command in India, Capt. Knox is the man of all my acquaintance I would choose for my second; his known gallant behaviour on all occasions, his Activity in executing all orders, his Humanity and, I will say, his strength of Constitution, qualifie him for the service of that country better that any Officer I know; another very great Qualification is his being respected and esteemed by the Country Powers, and particularly by our own Seapoys who are inspired by unusual confidence when he is at their head"[4].

Nov. 1759, present at the capture of Chinsura, and at the capture of Patna in 1760, having made a famous march of 300 miles from Murshidābād in 13 days with 1200 men, in the month of April, to relieve the Patna garrison; Knox himself marched the whole distance on foot.

After the campaign which resulted in the defeat of the *Shahzāda*[5], Major Carnac reported "I was fortunate in having so good a second as Capt. Knox, and wish I could have kept him longer with the Army, but as he now looks upon the fighting part of the Campaign as being over, he has pressed me so strongly for leave to resign, that I could not refuse; indeed so violent is his longing to return to his native Country; that it amounts to a disease, and it would be a degree of cruelty to detain him"[6].

However at the special request of the Council Knox withdraw his application, and in Feb. 1761 was sent with a small body of troops to command in Midnapore, which had then only recently been taken over [1]; during the two years he held this command, he employed James Nicol [qv] on a survey of the province, and constructed a map of the roads [21].

It has been suggested that some of the maps brought home to Orme by Vansittart [211] may have been obtained from, if not made by, Knox[7].

July 1763, on the rupture with Mīr Kasim [24], was recalled from Midnapore and took part in the battle of "Oodua Nullah" [229] as QMG. to Adams' force.

"On arrival at Patna[8], Major Adams directed Major Knox...to examine the enemy's position and the defences...with a view to laying down a plan of attack; Major Knox, who possessed considerable skill in military engineering, having been educated at Woolwich [341], and constantly employed in Surveying during his course of service in India"[9].

9–12–63, took over command from Adams, but being already seriously ill died the following month[10].

KYD, Alexander. Ben. Engrs.

b. 14–3–54, in Scotland. d. 25–11–1826.

Ens. 11–12–75 ... Lt Gen. 12–8–1819. SG. Bengal 1788–94 [260 n. 2].

Son of Capt. James Kyd, RN., and Hannah Bevis, his 1st wife; nephew of Robert Kyd, Ben. Inf.[11] [qv].

Had 3 natural sons, James, Robert, and Alexander, the youngest of whom was born 1797 [347].

m., Clifton, 13–11–1804, Elizabeth, 2nd dau. of William Wagstaff, apothecary in Manchester, widow of Edward Hay, Ben. Civ. She d. 22–1–1819, aged 56.
Hodson.

Oct. 1775, arrd. Calcutta on board the *Nottingham*; appd. Fd. Engr. to the army in Oudh, for the special duty of destroying forts in Kora[12] and the *doāb*[13] [55].

1778, when war had been declared between England and France, and Hastings was arranging to send a large Bengal contingent to support Bombay against the Marāthas [4, 38], Philip Francis writes that, despairing of any result in his attempts to persuade the GG. to attend to the defence of Bengal, "he himself, with the assistance of Kydd and Watson, two of the Company's Engineers, devised a plan for the defence of the provinces"[14].

Dec. 1780, posted to Goddard's army in Bombay, going round by sea from Calcutta[15]. 1–1–83, Appd. to act as QMG. to Bengal Dett., and 2–2–84, was a member of the committee directed to take charge of the effects of Duncan Stewart [qv.], who had died on the return march.

Sept. 1784, on sick-leave to Chittagong, and spent several months exploring coast of Arakan for possible harbours[16] [46].

Jan. 1785, Appd. to succeed his uncle Robert [347] as "Fort Major and Barrackmaster of Fort William", an office which he continued to hold under the title of Town Major[17], probably till appd. SG.

1787, Deputed to survey Penang [5, 46–7, 261], and visited Kedah and Achin on return journey [47].

1788, Sent by Lord Cornwallis on special mission to report on defences for Tellicherry on Malabar coast and Siddoo Harbour in Sumatra; "I have had before me for some time

[1] Sometimes Randfurlie or Ranfurlie. Ranfurly is the usual spelling of the lands in Renfrewshire whence Knox, Earl of Ranfurly, takes his title. [2] Sepoy batts. then numbered about 200 men [267]. [3] *Memoir*, 1783 (67–8); Polier [qv] also made surveys on this expn. but these are mentioned by Rennell separately. [4] Forde (215). [5] Shāh Alam [24 n. 6]. [6] BSCC. 28–1–61. [7] S. C. Hill (38). [8] Too late to prevent the massacre of English officers by the infamous Samru. [A-B 3]. [9] Broome (395). [10] Eulogy, B to CD. 20–2–64 (18). cf. HMS. 808 (205), 19–12–64. [11] Henry Dodwell (203 n.). [12] 63 B/8. [13] BS & F. 23–12–76. [14] Weitzman (119). [15] BPC. 28–12–80 (5). [16] Advance copy of report to Warren Hastings, 24–1–85, says that he had recovered "in August last". BM Addl MSS. 29167 (412). [17] BPC. 21–1–85.

the report made by Capt. Kyd of his survey of Prince of Wales Island, and, wishing to avail myself of the experience of Sir Archibald Campbell [101 n. 9] in deciding upon the plan to be recommended to the Court of Directors for fortifying that Island and the Harbour belonging to it, I have directed Capt. Kyd to proceed to Fort St. George, and to lay his report...before Sir Archibald Campbell. ... I have been also induced to make use of Capt. Kyd's talents as an Engineer in desiring him to go from Madras to Tellicherry to survey and examine the works and lines at that post, ... that he may judge necessary to be made at a moderate expence for securing Tellicherry against a sudden Native or European attack. From Tellicherry Capt. Kyd is directed to proceed to Siddoo Harbour to ascertain whether it would be practicable to render it a safe and convenient Port for King's ships in time of War[1] [47].

Kyd reached Tellicherry in April at a time when that place was alarmed by a visit of Tipu to the Malabar Coast; but his visit was apparently not made with any hostile intention, and Kyd was able to send reassuring reports; he further convinced Sir Archibald Campbell "that Tellicherry does not possess any advantages for the purposes of commerce, Politics, or Military operations, and...it is for the interest of the Company to dispose of, or relinquish that settlement as soon as possible".

After surveying Tellicherry and Darmapatam, Kyd visited Bombay where he assured Govt. "that the Lines, the repairs to which had been set on foot some time before the rains on the appearance of Tippoo in the neighbourhood, were in considerable forwardness when he left Tellicherry the end of April, ... nor did he hesitate to give an opinion that the present Garrison was fully adequate to the protection of the place, until a reinforcement might be sent down with safety"[2].

Returning from Tellicherry he took with him a consignment of pepper plants for the Botanical Gardens at Sibpur, which his uncle had started, and with them two Moplahs "having a competent knowledge of the cultivation of those plants"[3].

15–11–88, Appd. "Surveyor General & Commandant of the Fort of Budge Budge [43, 260]", which duties did not prevent a visit to Patna the following year, which also included a report on buildings at Monghyr.

Dec. 1789, to the Andaman & Nicobar Is. with a naval squadron to survey all suitable harbours. Took obsns. for lat. on Diamond I. [43, 49]; made a complete circuit of the Andaman Is., survd. Nancowry Harbour, and arrd. back in Calcutta by end of April 1790 [5, 43, 261, 313].

Both on this trip and on that to Penang he took Colebrooke as asst. survr., extracts from whose journals have already been given [47, 48–9, 327–8].

Six months later preparations were being made for a decisive campaign against Tipu, and once more the GG. chose Kyd for a mission of trust, sending him down to Madras with the following instructions; "The Chief Objects...are to learn as correctly as you can...what is the nature and face of the country which lies between the passes leading to the Mysore country and the Center and Southern Armies; to obtain the most accurate information possible of the Number and precise situation of the passes into Tipoo's country; which of them are calculated for the passage of Artillery, and which of them...naturally strong and defensible [112][4]. You are likewise to endeavour to make yourself fully acquainted, for my information when I arrive at Madras, with the state of the country and roads[5].

Kyd left Calcutta Nov. 11th, and on Lord Cornwallis' arrival at Madras joined his staff as ADC., and throughout the campaigns of 1791 and 1792 took a prominent part in attacks on various forts, making sketches and plans, and excercising general control of the various surveys [5, 43, 112–3, 130, 175, 177, 187, 237].

After the capture of Nundidroog, 18–10–91, Cornwallis "thanked Captain Kyd, his Lordship's A.D.C., for the zealous and able professional assistance which he gave as an engineer"[6].

On the conclusion of peace, Kyd carried a survey through Coorg down to the Malabar coast, returning to Calcutta by sea from Anjengo [113]. Again thinking of his uncle, he brought four cinnamon plants from Tuticorin[7].

Towards the end of 1792 he was selected to relieve Blair in the Andamans, and to prepare estimates for fortifying the new harbour, Port Cornwallis, in the north island[8] [43, 49, 50]. Feb. 1793, he handed over the S G.'s office to Colebrooke, and took over charge in the Andamans on March 5th. By the custom of the period he continued to draw full pay and allowances as SG., in addition to adequate table allowance, whilst the unfortunate Colebrooke had difficulty in drawing sufficient allowances to pay office rent and establishment till Kyd resigned a year later [261, 329].

Soon after his arrival in the Andamans he had proposed the use of convict labour for clearing heavy timber to make room for profitable crops[9]. After his return to Calcutta he took with him an Andamanese boy as a personal servant[10].

The name Kyd I. is still given to an island about 20 miles N. of Port Blair.

1794, after his estimates for the fortification of Port Cornwallis had been forwarded to the Directors, Kyd made another visit to Penang, reporting, Oct. 20th, "I have completed a pretty exact Topographical survey of the present surface of this island, and think I shall be able to give a clear account of the state of the fortifications and the additions that would be necessary to put this place in a respectable situation [50]"[11].

The following year the Directors decided to abandon the Andamans altogether, and in 1796 Kyd moved all his establishment to Penang, and returned to Calcutta in May. After constructing powder magazines at Palta[12], he was, in 1798, transferred to Allahābād to superintend the remodelling of its forttifications. It is curious to note that his selection for this work was made because his plans and estimates were preferred to those of the Chief Engineer; he had to carry out the works according to his estimate "upon Honour", and received a salary of Rs 1500 during their execution[13].

[1] BS & Pol. 11–1–88. [2] Bo to CD. 1–1–89. [3] Bo MC. 28–10–88. [4] cf. Beatson [312]. [5] B Pol C. 10–1–90. [6] MGO. 19–10–91. cf. Vibart; Mackenzie; Dirom. [7] Arrd. Calcutta, July 1792. *CG.* 26–7–92. [8] BPC. 12–11–92 & Hickey III (361–2). [9] B to CD. 18–5–93 (19). [10] Symes (135). [11] BPC. 1–12–94 (3). [12] 79 B/5. [13] cf. Goldingham [338]. BS & Sep. 20–8–98.

He remained at Allahābād, for most of the time in command of the station, until shortly before he went on furlough in 1804.

There are several records of his receiving distinguished visitors during this period; the Governor General in Dec. 1801, and Lord Valentia in 1803; the latter writes, "We were at breakfast by gunfire, and immediately afterwards set off to visit Colonel Kyd, the Commanding Officer, at his house above the Fort. ... Improvements to Barracks have been carried on by Col. Kyd during a 5 years residence, and are executed in a very masterly manner"[1].

There is some interesting correspondence between him and the GG., Marquess of Wellesley, in 1804, on the subject of a private letter which Kyd had written to Garstin[2], of the Engineers, which had been indiscreetly shewn to the GG. All ended well however, and Kyd took home with him a letter of introduction to the Chairman of Directors, saying that he had "held a confidential situation in the family of Lord Cornwallis, and other meritorious services prior to the Marquess of Wellesley's arrival in India. He has been employed in the improvement of the works of the Fortress of Allahabad...with great skill and integrity to my entire satisfaction"[3].

The existing name, Kydgunj, of a suburb of Allahābād is a reminder of his connection with that city.

Oct. 1807, on return from furl., appd. CE. with seat on Military Board, until he proceeded on furl., Jan, 1810, to live in London till his death.

Dealing now with his family and private life.—His uncle Robert died unm., 1793, and left him the greater part of his fortune, including house and garden at Sibpur. The adjacent grounds, laid out as botanical gardens, were formally transferred to the Company the following year.

Alexander already owned a house in Chowringhee on the site now occupied by the United Service Club, and his name has been given to Kyd Street which runs past it.

William Hickey mentions another house which Alexander had owned in Kidderpore, and had sold to Saadat Ali of Oude; when Saadat Ali succeeded as "Vizier of Oude" 1797, he retored the house to Kyd, with an additional 150 bighas of ground.

His sons James and Robert (*DIB*) were sent to England to be trained in ship-building, and on return took over the docks founded by Henry Watson [qv]. They held jointly the office of *Master Shipbuilder to the E.I.C.* till 1815.

James kept a series of tidal obsns. at Kidderpore 1806–27, and wrote an important note on *The Tides the Hooghly River*; 1835, Memorial to CD. *IO Tracts* 146.

Robert d. St. Helena 1820–1, and James 1836, when the dock-yard was purchased by Govt.

By their father's will, 18–12–1823, the house in Chowringhee was left to James, at that time head of the ship-building firm Messrs Kyd & Co.

Robert left property to his natural sons, Hayes, James, and Alexander, born to his housekeeper Lavinia Evelina Hitchcock; "if they die previously, then to Lt. Gen. Alexander Kyd of Bengal Engineers, and then to Mrs. Elmsal, a sister of Lt. Gen. Alexander Kyd"[4].

The general's youngest son, Alexander, b. 1795, bapt. 16–1–1802, was, 1823, in business at Abchurch Lane in the City of London.

The general left the portrait of his wife to her sister Mrs. Morgan, and left to a friend "my jade Tortoise and the table it stands upon, which I hope he will bequeath to the British Museum or the India House".

KYD, Robert. Ben. Inf.

b. 1746. d. 26–5–93, Calcutta. MI. Memorial urn, Botanical Gardens, Sibpur.

Ens. 27–10–64 ... Lt. Col. 7–12–82.

Uncle to Alexander Kyd [*sup*], "of an old Forfarshire family"[5].

Distinguished botanist. *DNB.*; *DIB.*; Hodson.

1766, on staff of 1st. Bri. at Monghyr during "Batta" Mutiny; sd. general petition surrendering comns. 1–5–66[6] [25 n. 3].

1767, Survd. route of Kinloch's expn. to Nepāl [75].

22–1–85, Resd. office as Fort Major and Barrack Master, Ft. William, Warren Hastings writing to Sir John Macpherson who was succeeding as GG., "He assures me that if you shall be pleased to confer the office on his Nephew, he himself will continue to officiate for him till his arrival, [Alexander was on sick leave to Chittagong], and will be answerable that no Inconvenience shall rise from his resignation of it. He declares that he has not Health to execute it as he ought, and wishes to prepare for his departure from the service. I am so much obliged to him that I shall esteem your acquiescence in this *solicitation* as the greatest favour you can grant me"[7].

This request was granted, and Robert then became Sec. to the Mil. Dept., though from the following letter he seems to have lost this post during the retrenchments of 1785. Jan. 1786, wrote home to Warren Hastings from Masulipatam, where he had gone for the recovery of his health; still "very sick", he discusses botanical subjects, and continues, "From this place I return to Calcutta, under pressure of my present and mortifying Disappointment. I trust to you for my being restored by the Court of Directors to such an appointment as you deem suited to my limited and retired views. ... Under the present administration in Bengal I wish not to hold any Employ, but shall prefer living in retirement on my present leave of absence till I hear from you[8]. I have only further to add, that I confidently rely on your protection to Alexander Kyd whom I trust will not prove unworthy of the appointment of Town Major & Barrack master, which you was pleased to confer on him, and which he now continues to hold"[9].

Later in the year he resumed appt. of Sec. to the Mil. Dept, and shortly after founded Botanical Gardens at Sibpur. His enthusiasm for botany brought him wide correspondence about trees, plants, and vegetables, mostly of economic and commercial interest. At his death in 1793 he appears to have been Sec. to Mil. Dept. of Inspection[10].

He left the bulk of his property to his nephew Alexander, and

"To my natural child, Nanny, £2,000; the future care and education of this child I leave to Major Alexander Kyd. ...

"The rest of my fortune I leave to Alexander Kyd, to whom I commit the charge and education of my child. Rs. 6,000 to Joogoo, mother of my daughter Nanny. ... To the other native known as George, in reparation of injury done him by his former master, in alienating him from his tribe (understood Rajpoote), converting him to Christianity, and secluding him from all future connection with his family, the monthly sum of six rupees during his life, on condition of their continuing to serve Major Alexander Kyd during his residence in India. ...

[1] Valentia (167). [2] BM Addl MSS. 13715 (21–3, 89), Ft. Wm., 12–1 to 18–3–1804. [3] The only reference that Markham makes to this distinguished officer, is a single line recording his unimportant survey from Seringapatam to the Malabar coast in 1792, Markham (57). [4] Ben. Wills, 1821. [5] Sylhet Dist. R. (60). [6] Strachey (153). [7] Henry Dodwell (203). [8] Macpherson was most unpopular, not solely on account of his being the instrument of retrenchment. [9] BM Addl MSS. 29169 (311) 13–1–86. [10] *CG.* 30–5–93.

"The remainder of my fortune, including my House & Garden at Seebpore, and all monies or effects of mine whatsoever, in Europe and here, to the aforesaid Alexander Kyd.

"It is further my desire that I may be buried in my own Garden, without the attendance or Offices of any Priest whatever. No military ceremony to take place at the Funeral". The exact place of burial in the Garden was then specified.

"There are in the house at Seebpore 3 Boxes containing Botanical drawings of the Plants in the Environs of this... District, also a Box and several Books containing an unfinished collection of the Birds indigenous to this tract, as also of such as migrate here from the adjoining frontiers during the cold and hot weather, also of the Fish frequenting the Hoogly; These having been collected at the Company's expence, are public property, and should be transmitted to the Court of Directors"[1].

The following announcement comes from the *Gentleman's Magazine;* "July 16th 1799, at Pittenween in Scotland, Geo. Forrester, Collector of Customs at Anstruther, married Miss Anne Kyd, daughter of the late Col. Robert Kyd".

LAW de LAURISTON, Jean. French Inf.
bapt. 3–11–19, at St. Roch, Paris.
d. 16–2–97, Paris.

Elder son of William Law[2], who settled in France and placed his sons in French service; the family title, Baron de Lauriston, was taken from their home in Midlothian, Scotland.

Elder bro. to Jaques-Francois, who rose to be Col. in the service of the French EIC., Jean being a King's officer[3].

m., 1755, Jeanne Carvalho, a Portuguese lady.

1742, Arrd. India.

1761, cr. Chevalier de St. Louis; 1780, Maréchal de Camp. *DIB.; Three Frenchmen.*

1756, Chief at Cossimbāzār; sheltered English prisoners sent to Murshidābād after the capture of Calcutta by Surujud-Daula [249 n. 1]. The French remained friendly to the English till news arrd., Jan. 1757, that France and England had been at war since the preceeding May. Clive and Watson then captured Chandernagore, March 1757 [222, 309, 311].

Under pressure from the English, as well as from the Nawab, Law was forced to retreat up country and, pursued by Coote, escaped beyond Ghāzipur. Until 1761 he lived precariously on supplies sent by Bussy from the south, by his wife from Chinsurah, and from a secret store at Patna. His force consisted of 175 Europeans and 100 sepoys. Anquetil-Duperron served with him for a time [309].

Law led his little force to Lucknow, and then to Delhi, Agra, and to Chhattarpur in Bundelkhand. In 1759 he joined Shāh Alam [24] in his invasion of Bihār, and in 1761 made a dramatic surrender to Carnac and Knox[4]. He was sent down to Calcutta and the following year deported to France where he was given an honoured reception.

June 1761, Appd. "Commissaire et Commandant Général ...aux Indes Orientales"; 1763, Governor of Pondicherry; though he did not return to India till end of 1764, commissioned to receive back the French settlements on conclusion of peace; by the following June he was installed as Chief of Chandernagore[5].

During his wanderings in Upper India he kept journals and sketches of his marches, which he passed to D'Anville on his return to France [27, 222, 268]. A copy of his original sketch, together with his journals in fdbk. form, and his History of Bengal 1756–61, is preserved in the British Museum [222 n. 1]; letters to Orme as late as 1785 also exist[6].

Rennell used Law's "MS. maps and observations" in the compilation of his general map of Bengal of 1774 [226 n. 6].

LAWMAN, George Augustus. Bom. Art.
b. 1750–1. d. Dec. 1802, Edinburgh.

Lieut. Fwkr. 4–3–72 ... Bt. Lt Col. 3–5–96; Ret. 3–12–99.

BoPC. 6–10–78, ordered to the Presidency from Broach, "having finished the part of the survey of That Purgunnah allotted him" [122].

LENDRUM, John. Bom. Inf.
b. 1746(?). d. 1783–4.

Ens. 1–10–69 ... Capt. 3–2–79.

Youngest son of George & Mary Lendrum of Moorfield, co. Tyrone.

BoPC. 23–4–79, Ordered from Bombay to Broach, for survey under Turner [122].

1783, with 11th Batt. Bom. Sepoys, taken prisoner[7] with Mathews, March 28th [125]; poisoned whilst a prisoner at Bednur.

LENNON, Walter Caulfield. Mad. Engrs.
b. 1759. d. 3–1–1835.

Ens. 19–10–82 ... Lt. Col. 1–1–1806; Ret. 14–11–1810.

m., in England, 18–1–95, Emily, dau. of Morley Pendred & Lady Martha Saunders.

1783, with dett. marching from Ellore through Ongole against *poligars* in Cuddapah and Sidout, and survd. route from Ongole; had many adventures and suffered from "a violent fever" [100].

1786, Stationed at Masulipatam and, at his own expence, explored the Godāvari, and offered to make a detailed survey in return for personal profits on floating down teak [105]. Made further proposals for survey of cultivated lands for revenue purposes [144]. Took sick-leave to China to recover from fever, losing most of his papers [100].

April 1789, Appd. astr. asst. to Topping, and took series of obsns. for the long. of Madras, being relieved by Goldingham July 1790 [172].

Sept. 1790, Posted to the Centre Army under Kelly [344], and given comd. of dett. of Pioneers, regarding duties of which he received detailed instructions from the CE.[8]. Present at most of the important sieges and actions in Mysore during the compaigns of 1791–2. 1793, Furl. to England on sick leave.

1795–6, Engr. and Sec. to Adm. Rainier's expn. to Molucca Is.[9], his journal and report being preserved[10].

1798, Proposed a closed harbour at Madras as the only way to provide secure shelter for shipping, writing a 50 page memoir on the subject, but nothing done till fifty years later[11]. GO. of 23–6–98, again granted leave to England for his health.

1803, Put up plans of Ft. St. George and Blacktown shewing proposals for embankments and sluices communicating between sea and river, with other improvements for the port[12].

1805–6, Engr. in charge of repairs at Seringapatam.

MACALISTER, Matthew. Mad. Inf.
b. 1757. d. 23–12–1829.

Ens. 30–8–78 ... Bt. Capt. 1–6–96; Ret. 6–6–98.

Of Bar & Rosehill, Scotland.

[1] Ben. Wills. 1793–4. [2] Bro. of John Law (1671–1729), *DNB.* [3] HMS. 774 (1059). [4] *Three Frenchmen* (126–9). [5] *Ben P & P.* II (351). [6] Orme MSS. 277. [7] *Late War in India* (202, 244). [8] Mack MSS. LXIX. 6–10–90. [9] about 128° E. [10] BM. Addl. MSS. 13874 & HMS. 441. [11] Love (503). [12] BM Addl MSS. 13905 (a, b).

m., 1st, Edinburgh, 12–6–97, Margaret, dau. of Col. Donald Campbell of Glensaddle.

m., 2nd, 23–12–02, Charlotte, dau. of James Brodie of Brodie.

Elder bro. to Charles, also Mad. Inf., (Ens. 12–5–78; Lieut. 27–1–82; to Europe on sick leave, 1792). Charles is not likely to have been the survr. mentioned below, who is occasionally referred to as Capt. M.

10–9–80, Taken prisoner at Baillie's disaster [40], and not released till, 10–2–84, permitted by Tipu to carry despatches from Mangalore to Tellicherry [1].

1791–2, Survd. routes of the Mad. Dett. with the Nizām during Mysore War [115–6][2].

MACKENZIE, Colin. Mad. Engrs.
b. *c.* 1753, Stornaway, Hebrides Is.
d. 8–5–1821, near Calcutta.

Ens., Mad. Inf., 16–5–83 ; tr. to Engrs. 23–5–86, antedated to 16–5–83 ... Col. 12–8–1819. SG. Madras, 1810–15 ; SG. of India, 1815–21.

Younger son of Murdoch Mackenzie, merchant and 1st Postmaster of Stornaway, and Barbara his wife.

His elder bro. Alexander d., Hastings, 25–9–1816 ; there was another bro. Kenneth, and a sister Mary, who, lived all her life at Stornaway, and d. unm., "a wealthy old lady", 29–9–1829, in her 80th year.

A memorial stone to Colin Mackenzie stands in Eye churchyard, near Stornaway [3].

m., 18–11–1812, at the Lutheran Church Batavia, Miss Petronella Jacomina Bartels, a Dutch lady born at Trincomalee in Ceylon. After Mackenzie's death she m. Lieut. Robert Page Fulchner, of the Ben. Inf. (Hodson), at the Cape of Good Hope, 18–2–1823.

CB. 4–6–1815.

DNB. ; *DIB.* ; Wilson. H.H., 2nd Edn. (bio. sketch)[4].

From 1778 or earlier, Comptroller of Customs, Stornaway, the last of his frequent spells of leave expiring Jan. 1783 ; other particulars of his early life are given by his friend Alexander Johnston[5] ; "Colonel Mackenzie was a native of the island of Lewis ; as a very young man he was much patronized, on account of his mathematical knowledge, by the late Lord Seaforth[6] and my late grandfather, Francis, the fifth Lord Napier of Merchistoun. He was for some time employed by the latter, who was about to write a life of his ancestor John Napier, of Merchistoun, the inventor of logarithms, to collect for him...an account of the knowledge which the Hindoos possessed of mathematics, and...of logarithms.

"Mr. Mackenzie, after the death of Lord Napier, became very desirous of prosecuting his Oriental researches in India. Lord Seaforth, therefore, at his request, got him appointed to the engineers on the Madras establishment in 1782, and gave him letters of introduction to the late Lord Macartney, the then Governor of that presidency, and to my father[7], who held a high situation under his lordship at Madura.

The nomination to Engineers did not pass through, and, 15–1–83, the Directors refused Mackenzie's petition "for a passage to Fort St. George to join the 78th Foot as a Volunteer, or for an appointment in the Company's Military"[8]. However someone must have intervened at the last moment, for three days later a letter issued advising the Madras Govt. that he had been permitted to sail in the *Atlas*[9] which he probably joined at Portsmouth, for the *Atlas* left the Downs 17–1–83, Portsmouth 11–3–83, and arrd. Madras 2–9–83, Mackenzie being now 28 years of age.

Nothing was said about any appt. to the Engrs., and when the official list came out, he was gazetted Ensign of Infantry from 16–5–83[10] [272].

March 1786, the Directors refused his petition "praying to be removed from the Infantry to the Corps of Engineers"[11], but again had to relent, for in Oct. the Madras Govt. wrote home saying that from May 23rd they had permitted "Ensign Colin Mackenzie of the Infantry to remove to the Corps of Engineers", to complete est.[12], so the Engr. list of 14–10–86 shows him as Ens. from 16–5–83.

Soon after his arrival Mackenzie visited the Johnston's at Madura, where Mrs. Johnston was engaged in continuing the search regarding the early Hindu system of logarithms[13].

At the close of 1783 he joined Fullarton's force and served in Dindigul and Coimbatore, being attd. "to a corps of Native troops" in Dindigul valley during May 1784, in which year he made his first surveys.

He was then transferred to "professional duties" in Madras and Nellore, and was on survey in the neighbourhood of Nellore during 1787 [111].

Oct.-Nov. 1788, he accompanied the force which occupied Guntūr Circār, and survd. the roads from Nellore to Ongole, and right through the Circār as far as Chintapalle on the Kistna [111–2].

In sending him to wait on the C-in-C. with his plans and reports, the CE. wrote "As they are works of great Labour and of great merit, undertaken by that gentleman at his own expence, thro' zeal for the service at a time the War was likely to be carried into that Country, I flatter myself you will think deserving of some mark of your approbation, and that you will be pleased to grant him such a compensation as may place him on a footing with Surveyors employed in such service"[14].

Jan. 1790 Detailed to make complete survey of Guntūr, but before he could start work war broke out against Mysore, and he was posted as Engr. to Gen. Medows's army [110], taking part in the capture of Palghāt, on which the CE. wrote to him "Have received your letter of 22nd informing me of the fall of Palghautcherry, and I congratulate you on the credit the Corps has gained, having been informed their business was not only well, but speedily, performed"[15].

The following account has been given of the siege, "The batteries opened against Palligautcherry on the morning of 21st September. ... Capt. O— of the 22nd Battn., and Lieut. Mackenzie of the Engineers, who were both here formerly, and knew the place, went to reconnoitre in the evening. ... Lieut. Mackenzie, with the pioneers and working parties, with gabions and fascines, also came up from the east battery, ... and in the face of an incessant fire of musquetry and frequent discharges from a gun on a bastion immediately opposite, soon converted the top of the glacis into a parapet"[16].

During this campaign Mackenzie survd. the marches of the army, and also Palghāt[17] [6, 111 n. 1].

[1] HMS. 613 (652). [2] Fdbk. MRIO. M 162. [3] *Reminiscences.* II (347–8). [4] Biography in hand by Mr. W. C. Mackenzie, 1941 ; *The First Surveyor General of India. Colonel Colin Mackenzie.* [5] *DNB.* ; President of Council, Ceylon, 1811–9 ; Evidence in HC. Report (para. 1930). [6] Kenneth Mackenzie, cr. Lord Seaforth 3–12–71 ; d. 28–8–81, on voyage to India, comdg. 78th Ft. [7] Samuel Johnston, Mad. Civ., m. Hester, dau. of Francis, 5th Lord Napier, of Co. Dumfries. Paymaster at Madura, 1783. [8] CM. 15–1–83. [9] CD to M. 18–1–83. [10] MGO. 4–4–84. [11] CM. 14–3–86 [12] M to CD. 14–10–86 (11). [13] HC. Report (1930). [14] Mack MSS. LXIX. 20–7–89. [15] ib. 6–10–90. [16] Mackenzie, I (82). [17] "Route of a Detachment under Lt Col. Stuart from Coimbatore to Palghautcherry". 26–7–90. DDn. 246 (145).

In Dec. Lord Cornwallis arrd. in Madras to take supreme comd., and the CE. wrote to Mackenzie, "I have shown him your appointment to Guntoor, which your desire of serving in the field has suspended, and my wish that you should have been employed in the Staff-line of the Corps, whilst with the Army. ... I put at the same time into his hands your journal of the Northern marches"[1].

During campaigns of 1791–2 Mackenzie was ADC. to the CE., first Maule and then Ross, and took a prominent part in capture of many fortresses, and was several times mentioned in despatches[2]. A comment on the capture of Bangalore given in the *Madras Courier* of 3–11–91, would hardly pass an editor of today; "Lieut. Mackenzie in his department demonstrated by his success in pursuing the object, how essentially necessary it is, that the practical Engineer should unite art with science".

1–4–92, at the close of the war, appd. Engr. & Survr. to the Ellore Dett., now attd. to the Nizām's service as a Subsidiary Force[3] [7, 112, 116].

1792–3, Survd. the districts newly ceded by Mysore to the Nizām, "Cuddapah, Canual, the wild mountains of Yermulla and Nalmulla bounding the Carnatic as far as the Kistna". The country was far from healthy, and he writes to Ward in after years, "Your account of your boils...is precisely the same with myself in 1792, but I had a severe fever immediately after reaching Kurpa; after recovering from which, my body broke out in boils, and I even lost the use of my left thigh for some time"[4].

He survd. the whole course of the Penner past Cuddapah to Nellore, following it to the sea-coast by May 1793[5].

June 1793, after being "obliged to halt at Ongole by sickness and deaths among his followers and cattle" he was ordered "to return without delay to the Presidency" to take part in the siege of Pondicherry [112][6].

On his return he continued his survey of the country between the Penner and the Kistna, and again he and his party were overwhelmed by fever, and in 1794 retreated to Hyderābād with assistance from the Nawāb of Kurnool [299–300].

1794–5, Made several journeys in company with Kirkpatrick, the Resdt. [116, 345], and from Dec. to April accompanied the Nizām's army on march against the Marāthas, who defeated the Nizām at Kharda [116–8, 174–5, 205].

Makenzie then remained at Hyderābād working on his map of the Deccan, till called down in Oct. 1795 to join expn. to Ceylon, which resulted in capture of Colombo[7] and all other Dutch possessions in the island [117].

As senior Engr. he was instructed to make preparations for a long siege, which in the end proved unnecessary, as recounted by James Welsh [219];

"I was towards the end of the year detached to the sea-coast to make fascines and gabions to carry with us. ... Our first rendezvous was Negumbo, about 30 miles north of Colombo, then in the enemy's possession. ... Here we landed the fascines and gabions we had made, under the erroneous impression that we were not likely to find materials in Ceylon, the best wooded country in the world; ... they were afterwards all served out to the Bombay Grenadier battalion, at Colombo, for firewood"[8].

Mackenzie was still pressing for Colombo prize money several years later, claiming for a rate at a higher rank than Captain "as Principal Engineer on that Expedition, for which I was ordered down from Hyderabad in 1795, and sent to make the necessary arrangements in the southern garrisons, and at Manar[9] previous to joining General Stuart at Negumbo, (a journey of near 900 miles by land and 200 by water)"[10].

After capture of Colombo he was employed inspecting forts on west coast of Ceylon, returning May 1796 to Madras, where he stayed a few months to complete his map of the Deccan. On return journey to Hyderābād, Sept. 1796 to Jan. 1797, made "a military survey" through Guntūr [112].

After a few months at Hyderābād, during which he visited Gulbarga[11], he was once more called down to Madras to make preparations as principal engr. for expn. designed against Manila; this was abandoned, and he spent the following cold weather at Madras preparing a supplement to his map of the Deccan, and collecting a small staff of assistants, not returning to Hyderābād till April 1798 [118, 175, 286].

In 1796 Mackenzie had urged Govt. to appoint him Surveyor General at Ft. St. George, and also to increase his allowances, and this had been referred home with a strong recommendation [264]. In Feb. 1798 he again pressed for increase of his allowances, and a special allowance of 200 pagodas a month was sanctioned, and confirmed by the Directors [281].

He spent the hot weather of 1798 at Hyderābād and we have the following record of a visit by the botanist, Dr. Heyne; "The greatest acquisition I made was the friendship of Capt. Mackenzie, from whose experience and knowledge I have derived great benefit, and from whose correspondence I promise myself a rich harvest. He had always been attentive to minerological objects, and had lived a considerable time in that part of the country where the diamond mines are situated, so that even had he not been so industrious in surveying every accessible spot in his neighbourhood, he would have been led to satisfy his curiosity respecting the Diamond Mines; I was not therefore surprised to find among his papers several descriptions of the different mines". Then follows a note by Mackenzie dated 29–12–96 "on the Diamond Mines at Parteal"[12].

Towards the end of 1798 orders were received for the march of the Nizām's forces...to take part in the 4th war against Mysore; the French force at Hyderābād was broken up in Oct. [117], and Mackenzie says that "he was...employed in a confidential position in reconnoitring the French positions... previous to the arrival of our force, and in the measures which terminated in the dissolution of that Corps".

In Dec. he marched with the Nizām's Army, and gives the following account of the journey to Ambūr[13] [118]. "From the intimate knowledge acquired in these surveys I was enabled to suggest the Plan of the March...by the most secure and expeditious route at a critical time. After crossing the Kistna, when the Nizam's Contingent approached Tippoo's Frontier, and it became necessary to turn off into the Carnatic, when a season of great drought threatened much distress and delay, I voluntarily took charge of the duty of exploring the country some marches in front, of clearing the road through defiles

[1] Mack MSS. LXIX. 27–12–90. [2] Mackenzie (II 143–8) & Dirom (49, 197). [3] MMC. 12–3–93. [4] DDn. 83, 28–7–1810. [5] DDn. 246 (147). [6] Surrendered 23–8–93. [7] 16–7–96. [8] Welsh (28). [9] Manaar, 58 P/13. [10] DDn. 66, 7–10–1800. [11] 56 C/15. [12] Partyāl 56 P; *Imp Gaz. Hyderābād* (40) MRIO. M 160. [13] 57 L/13.

not before marched with carriages, and of ascertaining the best stages and watering places from Door, thro' the several Passes to Tripetty[1] of about 200 miles".

They reached Ambūr 1–2–99, and Mackenzie continues, "This junction with the Grand Army effected by a march of 464 miles, at the precise moment it was ready to move from Amboor, when the delay of one day might have been highly prejudicial to the success of the campaign, ...may confirm the utility of a previous knowledge of Countries wherein Armies are to move, and attending to the directions of the roads"[2].

During the march forward into Mysore, the command of the Nizām's army was entrusted to Arthur Wellesley whose regiment, the 33rd Foot, was added to stiffen it; Mackenzie continued as senior Eng., and in this capacity was in close attendance on Wellesley during the celebrated affair of the Sultanpett Tope on the night of April 5th–6th. The following extracts are taken from his journal[3].

4–4–99. In sight of City of Mysore [Seringapatam]. 5–4–99. In the evening at 4 p.m., attended Col. Wellesley to the General[4], ... viewing the City. ... Tope in front distant about 200 yards. Col. Wellesley was ordered to possess himself of it. ...

33rd Regt., 1st Batt., 10th Ben. Regt., 2 guns & Pioneers, were paraded as fast as possible, and about 7 p.m. we moved straight forward on the road leading towards Sultanpett; no knowledge of the ground appeared to have been communicated, nor was any one with us acquainted of the windings of the nulla after we lost sight of it on the left of the tope. ... While the officers at the head of the column deliberated on the road to be taken, one of the man said he observed a *light* in front; while we were speaking, a discharge of musquetry from the Tope threw the Party into some confusion; for being at the moment crowded on a steep narrow bank, the men naturally running to their arms, the expansion of the whole suddenly overset such as were on the declivity.

I was among several others thrown down, and on extricating myself from the crowd that pressed me down, found I was nearly alone, but surprised to find no enemy had advanced; all was dark and silent; Col. Wellesley came up to the head of the advance on hearing the firing, and with the assistance of the officers endeavoured to form the Party, but the firing commencing again from the Tope and to our left, extending so as to enclose us, the Party were again wavering: the grenadier's march was ordered to be beat, and at this moment the enemy's fire extending still further to our left, the greater part of the party suddenly disappeared. ... I returned to Col. Wellesley whom I found forming and encouraging a very small party to fire upon the enemy".

A long account follows, with sketch of the 2nd attack on the Tope, shewing the village, tope, and nullah of Sultanpett.

This affair was greatly exaggerated to the discredit of Wellesley, and has been told in many histories and biographies of the Duke of Wellington[5], though this account by Mackenzie is probably the only one written by an eye-witness. Blackiston refers to it thus, "As communicated to me by the only person who could possibly give a fair account of the business, that is, the late Colonel Mackenzie of Madras Engrs., who was then attached to Col. Wellesley's Division, and who accompanied him during the whole of the affair in question.

"Wellesley and Mackenzie with the Light Company of the 33rd which had got separated from the main body, came suddenly on a work of the Enemy's, who opened a heavy fire. The Light Company, finding themselves unsupported, retreated rather precipitately, leaving Col. Wellesley and Capt. Mackenzie by themselves. In this predicament they endeavoured to regain their Division, but in the attempt, owing to the darkness of the night, they quite lost their way, and it was not till after groping about for some hours that they succeeded in regaining the British Camp, but without their Division. ...

"For my part, even before I heard Col. Mackenzie's version of the affair, I was of opinion that the fact of Col. Wellesley's having fallen asleep on General Harris's table in the way he did, was a sufficient proof that he had not acted disgracefully. ... Besides, any imputation of deficiency of courage must equally have applied to Col. Mackenzie, whose bravery and *sang-froid* in action were proverbial. ... It is more than probable that, had not Col. Wellesley been so nearly allied to the Governor General, he never would have had a chance of getting over this affair"[6].

In one of the many accounts of this incident it is stated that Beatson had misrepresented it in his history, "hoping to give pleasure, being too courtier-like"[7]. There is no doubt that there was ever after a strong friendship between Mackenzie and Arthur Wellesley, and there was a tradition at Stornaway that "The Duke of Wellington...said at Badajos, when difficulties obstructed the progress of the siege, 'Oh that old Mackenzie were here'"[8].

During the siege of Seringapatam which followed Mackenzie was Engr. in charge of the batteries to the north of the Cauvery, from which side the successful assault was delivered [9, 118]. His journal contains many interesting details; "these minutes hastily written in moments of fatigue stolen from relaxation, or from refreshment, may be allowed to partake of the impression under which they were noted down from recollection or recent information, without impeachment of the veracity of the journalist".

The journal contains several neat little sketches illustrating the position of batteries at various points. In a later letter Mackenzie describes his duties during the siege; "On joining the Chief Engineer of the Army on 17th April, I was ordered suddenly next day over the River, placed in charge of the Engineer Department with the Bombay Army, ... and from that time to the capture of Seringapatam, directing...the whole of the works, approaches, and batteries on that side...generally by the immediate orders of the C-in-C. through his staff"[9].

Staff cars were not available in those days; "The Commander in Chief desires to see you *immediately*; Major Beatson sends his Palanquin for your accomodation, which will meet you on this side of the river"[10].

Wellesley wrote of him "I shall say nothing of Mackenzie's merits as a surveyor; his works are a strong proof of them. He was under my command during the campaign, and never saw a more zealous, a more diligent or a more useful officer. During the siege he conducted operations on the north side of the Cauvery; and although the effect of the batteries he constructed has been acknowledged and a subject of praise in the General's orders, and notwithstanding that by his exertions during the siege he has entirely lost his health, his name has never been mentioned"[11].

In another letter Mackenzie writes "On the junction of the Bombay Force, I was placed in entire charge of the Engineers' Department with that Army north of the River, and had the honor of directing the whole of the works, approaches, and Batteries on that side during the progress of the siege. From the 17th April, the day of my taking upon me this important charge, to the 4th of May, I had

[1] Tirupati, 57 O/6. [2] DDn. 43, 21–10–1803. [3] BM Addl MSS. 13663 (66). [4] Afterwards cr. Baron Lord Harris (1815). [5] *v.* Hook's *Life of Sir David Baird* (193–4) etc. [6] Blackiston, I (79). [7] Hook's *Life of Sir David Baird* (193–4). [8] *Reminiscences* (348). [9] MMC. 26–4–1808. [10] Note of 21–4–99. [11] *Supply. Desps.* 2–8–99.

rarely more than two or three hours of rest either by night or day, a degree of exertion which nearly proved fatal to me in the severe illness which it occasioned"[1].

In June he was sent up from Madras to assist the Mysore Commissioners with maps [119], but the following month he had to return to the coast on account of ill health. In Sept. he was appd. to charge of the Survey of Mysore [9, 119], and spent the rest of the year at Madras making the necessary arrangements, but was not fit enough to move up to Mysore until March 11th 1800.

The story of his great work on the Mysore survey, and of other distinguished services will be given in a later volume, but a summary is noted here;

Appd. SG. of Madras with effect from 1–12–1810.

CE. with Java Expn. under GO. of 12–3–11; On special duty in Java till Aug. 1813, and in Bengal writing up reports till March 1815, when he resumed duty at Madras.

Appd. SG. of India under GG in C.'s letter of 17–4–1815, remaining at Madras until July 1817, when he moved to Calcutta. Was in bad health almost from his first arrival at Calcutta, and d. 8–5–1821 whilst cruising on the Hooghly for the benefit of his health.

Throughout his service he devoted much of his time to making a vast collection of historical antiquities [97], an account of part of which is given in Wilson's *Catalogue of Oriental MSS of Col. Colin Mackenzie*, Calcutta, 1828. A further account is given in *The Mackenzie Collections* by Blagden, London, 1916.

MACLEAN, John. Mad. Engrs. & Inf.
d. 12–2–68, shot through the head, in action at Tingricotah.

March 1762, Came out on the Engr. list; 1766, tr. to Military, as he "sees no advancement in Engineers"[2] [266, 272].

Date unk.; Survd. fort & hills of Santgad, 30 m. W. of Vellore, and also passes between Mysore and Carnatic[3].

MACLEOD, Duncan. Ben. Engrs.
b. 20–2–80. d. 8–6–1856.

Ens. 28–11–95 ... Lt Gen. 11–11–1851.

Son of Sheriff Donald Macleod of Geanies, co. Ross, Advocate, and Margaret his wife.

m., Calcutta, 28–4–1804, Miss Henrietta Caroline Lestock Friell. Father of Sir Donald Friell Macleod, KCSI., Lt. Govr. of the Punjab 1865–70, and of Henrietta Peach, wife of Robert Boileau Pemberton, Ben. Inf. a distinguished survr. *DNB.*

19–10–98, with Craig's force in Oudh [57–8]; Survd. "hill of Jaujemow", 3 *coss* from Cawnpore; 1800, Survd. route Cawnpore to Etawah & Agra.

Sold to Thomas Wood, of Engrs. [qv] the house and lands "in Camac St. Calcutta"[4], part of which are now known as Wood St. where the SG.'s office is now situated.

MALLOCK, —. Ben.

Visited Sambalpur with Alleyne in 1763 or 1764, and obsd. lat. [30, 153, 309].

Nothing further is known of him.

MANLEY, James. Bom. Inf.
b. *c.* 1762. Drowned, 1–2–99, on passage from Malabar to Bombay.

Ens. 21–11–82 ... Capt. 4–7–97.

Eldest son of Lt Col. James and Leonora Manley.

23–5–83, Taken prisoner in sally from Mangalore; 1793, on survey in Malabar with Emmitt [131]; 1796, with Resdt.'s escort at Poona.

MANNEVILLETTE. see APRÉS de MANNEVILLETTE.

MARSACK, Charles. Ben. Inf.
b. 1735–6. d. Nov. 1820.

Ens. 3–11–65 ... Capt. 26–6–71; Resd. 27–1–79.

Natural son of Frederick Louis, Prince of Wales (and thus half-bro. to George III) by Comtesse Marguerite de Marsac; the Comte de Marsac, a Frenchman, came over to England with the Court of Hanover.

m., before 1784, Charlotte, dau. of Richard Becher, Ben. Civ., of Calcutta; father of Robert Marsack, Ben. Inf.

JP. & DL. High Sheriff, Oxon. 1787.

Holzman (153).

With 1st Bri. at Monghyr and resd. comn. during the "Batta" Mutiny, 1–5–66 [000]; re-admitted under GO. of 11–11–66.

1779, Claimed payment on a bond for Rs. 51,173 for the sale of a *budgrow* "and sundry goods supplied...at the desire of the Nabob" of Oudh, with interest at 12% from 3–6–66[5].

1775, "Nawab of Oude is anxious to built a house of European design, and asks permission for Capt. Marsack to execute the work"[6].

1776, Raised a regt. of cavalry for the Nawāb of Oudh, which he comdd. till its transfer to the Company, Aug. 1777. Refused comd. of one of the newly raised Sepoy Batts. 12–7–78.

In his instructions for survey of Oudh & Allahābād Dec. 1776, Rennell directed the survr. to connect with Capt. Marsack's survey [183]. This survey was probably that preserved in SGO. up to 1786 as "Marsack's original plans of Oude & Shahabad", and was probably carried out under Polier's supervision 1773–4 [35].

After retirement Marsack bought the Caversham estate from Lord Cadogan; he was not a popular squire. "The strange retinue...was held to have polluted the sweet simplicity of the countryside; ... old French women, Swiss *Valets de Chambre*, Black boys, Gentoo coachmen, Mulatto footmen, and Negro butlers. ... They call Mr. Marsac—a very worthy East Indian—Major Massacre—and his improvements...—his devastation".

"Marsac...died, leaving property valued at over 182,000 pounds"[7].

MARSDEN, Thomas. Mad. Engrs.
bapt. 15–4–47. d. 19–3–71, Tripasore.

Ens. 12–11–67 ... Lieut. 26–1–69.

Son of John Marsden, Director of Bank of Ireland, & Eleanor his 2nd wife.

Appd. by the Directors in England "3rd Lieut. in Marine Service at Bombay; as during my voyage to India, I have found a sea life does not agree with my constitution, and having been educated in H.M.'s Royal Academy at Portsmouth, taking the regular course of Mathematics & Drawing", applied to the Mad. Council for appt. to the Engrs...and was duly admitted a Cadet.

[1] MMC 26–4–1808. [2] MS & Pol. 30–12–66. [3] Vibart I (71). [4] Wood's will, Ben. Wills, 1839. [5] BPC. 23–8–79. [6] BFC. 18–9–75 (9). [7] Holzman (25, 72).

1769, one of the only officers to express "his readiness to continue on the Engineering list" [272], and the Council noted him a "a very diligent and capable young man"[1]. However on 27–6–69 they had to report him to the Directors "for Factious and Inflammatory behaviour", and ordered "his dismission from the service of the Company"[2].

March 1769, Appd. to make a large-scale survey of Blacktown, for assessing the value of houses and land, completing this survey by the following Dec.; his surveys, however, could not be found two years later.

MARTIN, Claud.[3] Ben. Inf.

b. 4–1–35, at Lyons in France.
d. 13–9–1800, Lucknow.

Ens. 17–9–63 ... Maj Gen. 26–2–95.

2nd son of Fleury Martin, cooper, of Lyons, where he was ed., shewing a taste for math. and science.

Never married, but maintained a large est. in "oriental style" at Lucknow. MI. St. John's Ch. Calcutta.

DIB. EIMC. II (457); Hill; Besson.

At age of 16 enlisted for service in India, and arrd. Pondicherry 1752. Served first in Dragoons, and tr. to Lorraine Regt. *c.* 1758.

After capture of Pondicherry Jan. 1761, took service with the English, and given comd. of a "free company" of French soldiers embarking for Bengal in the *Fatteh Salam*. Sailing Aug. 26th, this ship was wrecked on the passage up, and the Ben. Council wrote to Madras, 6–10–61, "Monsieur St. Martin, an officer of the free company of French having been saved from the Fatteh Salam, we purpose returning him to the Coast in order to raise another Company of an hundred Men from among the prisoners now remaining with you"[4], and they record, 11–3–62, "The ship Norfolk arrives at the mouth of the Hooghly, having amongst her passengers, 106 French Volunteers under the Command of Monsr. Martin".

1763, Martin's company was attd. to the Eur. Batt. forming part of the force under Maj. Adams sent in pursuit of Mīr Kasim [24], and taking part in the victory at Undwah Nala [345]. Sheet XXI of Rennell's *Bengal Atlas* contains views of *Oudanulla* and *Chunargur*, both by Martin [229].

Feb. 1764, three companies of the Eur. Batt., mostly French, mutinied at Sawaut[5], and started to desert; "Lieut. Claud Martin did good service on this occasion [341]. ... One of his men had privately told him it was the French soldiers who were the instigators, ... and they offered Claud Martin supreme command of a Rebel Army which should serve Mir Cossim. This information helped to hold the British mutineers"[6].

The Directors were informed that "A sergeant and 150 of the French soldiers deserted to Oudh, a loss not much to be lamented. ... All the Frenchmen which remained in the Army after the mutiny, have been draughted and brought down to Calcutta. ... The Frenchmen are to be transported home"[7].

After bringing down these few men to Calcutta, Martin was promoted Lieut., 18–4–64, and was in comd. of two companies of sepoys in Aug. and present at the Battle of Buxar, 23–10–64[8]. In a despatch of 10–2–65 on the capture of Chunārgarh, he was commended for "particular care and assiduity during the siege". March 1765, after occupation of Lucknow, "Lieut. Martin was sent to one part of the country with 5 companies"[9]. Promoted Capt. 30–7–66.

Sept. 1766, it was suggested that as he was "well versed in the Business of surveying" he should assist De Gloss in the survey of Bihār [25], but by this time he was involved in the "Batta Mutiny", and was amongst the officers who, on 23–10–66, signed an address of sympathy to Sir Robert Fletcher after his conviction by ctml. [25 n. 1]. The Select Com. declared that this address "appears calculated to foment sedition, and to throw an Odium & reflect Dishonour upon the Council & Courtmartial", and resolved "that the officers who signed...shall be immediately dismissed the service, and rendered for ever incapable of holding any Employ under the Company, & sent home by the Ships of this Season"; Martin was to be sent home on the *Anson*[10].

He managed however to avoid deportation, but it is not known how he spent his time till re-instatement in Aug. 1769[11], neither is it known when he was first employed on survey.

Reference to his survey of Calcutta Lands has often been made [13, 51–2]. The heading *Part of a General Survey of the Calcutta Lands* suggests either that Martin intended to survey the country to the north and east, or that other surveyors were at work. It may be that Martin's survey was in extension of the detailed survey on which Hugh Cameron was employed when he died in 1764; none of Cameron's work is on record except his boundary survey of 1761–2 [136, 250 n. 5]. There is also the survey of which Alexander Stuart made a failure in 1768 [137]. Whatever other work was done, Colebrooke in 1800 could only find Martin's work in the southern *parganas* and Cameron's survey of 1761–2[12].

It is difficult to state when Martin made this survey. The copy at MRIO. bears his autograph as "Capt. of Infantry", which implies a date later than July 1766. The earlier date generally accepted is taken from an office label added at some stock-taking many years later, on which is a note "*1760 or 1764?*" by someone with no knowledge of Martin's story, for he did not reach Calcutta till 1762, was continuously in command of his Frenchmen till March 1764, and then of sepoys in Bihār and Oudh. His earliest opportunity of carrying out this survey, which could not have taken a day less than six months, would seem to have been after his dismissal in Jan. 1767, when he might have put forward his talent as surveyor to avoid deportation.

The survey is not included in the list left by Orme of those used by Rennell for the map he presented to Clive in Jan. 1767 [223]. It may even be assigned to the period between Martin's re-instatement in 1769 and his move to Krishnagar in 1771. Rennell's index map [33, 224] shows that Martin surveyed the whole area south of the Ganges and east of the Hooghly towards Bakarganj for the 5-mile maps, and this area would cover his survey of the Calcutta Lands. If all this was, however, carried out later than 1766, Martin must have done some other work to attract the notice of the Council when they recommended him for the survey of Bihār [25], and no record of such work has been found.

[1] MMC. 26–1–69. [2] CD to M. 23–3–70, (80). [3] Some times spelt 1st name Claude, but never used final "e" for surname. [4] BSC. 11–12–61. [5] 16 m. N. of Chainpur 63 O/8. [6] Innes (182). [7] B to CD. 20–2–64 (7); 27–9–64 (12); 11–3–65 (28). [8] Besson (131). [9] Caraccioli (473). [10] BSC. 6–1–67. cf. Nicol [qv]. [11] BPC. 1–8–69, & Besson, (132). [12] Martin's map is referred to in preface to *Ben. Sel., Canals.* 1865.

By 1771 his reputation was firmly established and in Jan. the Supravisor of Nadia asked that as Martin was passing through on his way to survey the province of Krishnagar [1] he might at the same time make a survey of all the embankments of the district, and submit an estimate of putting them into repair, for there were "some very large tracts of lands that now lay uncultivated and waste", and "he must assuredly be a far better judge of these matters than anybody here," and this was approved by Govt.[2].

After surveying Krishnagar he was sent to survey Cooch Behār, but went sick before completing the work; April 1773, he was present at the capture of Dellamcottah Fort [342], his view and plan of which appear on sheet XVIII of the *Bengal Atlas* [229]. He had volunteered his services for this small campaign, and the following year Govt. called the attention of the Directors to the "losses sustained by Capt. Martin in the attack made upon Chunhicotta[3] by the Boteas when on his duty there of Surveyor, and without any Military charge. ...We...add our recommendation that you will be pleased to allow Capt. Martin some compensation for losses amounting to Sonaut Rs. 6625, which he obviously sustained by a spirited and Laudable exertion for the Publick Service foreign from the Line of his Duty" [4].

In the *As. J.*, Vol. II, of 1816, is a paper entitled *Authentic Anecdotes of the Life of Maj Gen. Claude Martine.* The author says nothing of his connection with the mutiny of 1766, but makes the following vague reference to his surveys; "Shortly after this promotion [to a company July 1766] he was employed..to survey the North-eastern Districts of Bengal, being an able draughtsman, and in every respect well qualified for that purpose. When he had completed his journey to the North-eastern districts he was sent to Oude to assist in surveying that Province".

Polier had been ordered to superintend surveys in Oudh from April 1773, and Martin appears to have worked under him until surveys were closed in June 1774, when he took service with the Nawāb [34].

Dec. 1773, when discussing the appt. of batt. comdrs. the GG. wrote, "I have also passed by the following officers who have the claim to sepoy commands, viz, Capt. Martin. ... The first of these has ever been employed in the surveying branch and is a foreigner, altho' in general esteam as a brave and experienced officer, and a man of strict honour"; and the C-in-C. added "as to Capt. Martin, it was not an objection of detriment to that officer, ...but a conviction that the service and the Company would derive more benefits from his abilities in the surveying branch" [5].

The Nawāb of Oudh, delighted with his charming manners and mechanical skill, asked for his services, and by 1776 he was Supt. of the Nawāb's arsenal at Lucknow [6].

He was borne on the strength of his regt. until struck off in 1779, but states that "I have not drawn a rupee from the Company since 1776" [7].

The artist Hodges [337] makes the following reference to a stay at Lucknow during 1783 [8]; "On 16th [May or June] I finished this journey at Lucknow, when the heats and fatigue I had suffered brought on a violent dysentery, and a palpitation at the heart, from which I was long in recovering. Colonel Polier [qv] received me with his wonted hospitality; and I remained with that gentleman about ten days; my indisposition, however, rather increasing than abating, his house being a large bungalow was consequently very hot, and therefore Colonel Martin, who had a large brick house, had the goodness to invite me to his, where by his great and most friendly care, and the administering of proper remedies, I gradually recovered; to him, therefore, I may now say I owe the life I at present enjoy" [9].

In 1791 he joined the army in Mysore, providing as a gift to the Company "sufficient fine horses to mount a troop", and taking an active part in several actions as ADC. to Lord Cornwallis. To his great delight he was rewarded by promotion to the rank of Colonel "as an honorary mark of approbation", and in 1795 was further promoted to Maj. General.

He acquired great influence and wealth at Lucknow [10], and built a remarkable house which he called "Constantia" [11]. He died in 1800, leaving a will which is preserved at the India Office, and is well worth reading. Besides providing for the individual members of his vast household, whose personal history he gives in detail, he left £ 25,000 to each of the cities of Lucknow, Calcutta and Lyons, with special provision for the establishment of schools, to which the existing *La Martinière* schools owe their origin [2].

There are several portraits and busts of him in the Victoria Memorial Hall at Calcutta.

MATHER, John. Civil Survr. Drowned, March 1808, off coast of England.

Son of Robert Mather, of the Mill at Newburgh, near Aberdeen, and of Gight near Fyvie, Aberdeen.

MA., Marischal College, Aberdeen, 1780.

Probably arrd. Madras 1793 or 1794; having been "several times wrecked in the Eastern Seas" [12], it is possible that he may have been a ship's officer before coming to Madras [13].

Feb. 1795, Submitted the securities required from persons not in the services to be allowed to remain in the country [14].

Aug. 1794 [15], Engaged as "a professional surveyor" to survey the Baramāhāl and Salem Districts [7, 113–4, 147, 194]. Completed the survey by the end of 1798, more than 6,300 sq. miles, and was then proposed for a similar survey of Dindigul but, the survey of Mysore being a more urgent business, his services were placed at Mackenzie's disposal in Sept. 1799 [114].

During the Salem survey, drew salary at 25 pagodas a month up to July 1796, when it was increased to 50, and at the conclusion of the work was given an additional bonus of 1,000 pags. He asked to be put on contract for future work "for which I am willing to sacrifice 4 or 5 years more of my

[1] *Map of Krishnagar...& surrounding Country*, MRIO. 52 (12). [2] BSC. 1–2–71. [3] 20 m. N. of Cooch Behār, 78 F/10. [4] B to CD. 17–10–74 (83). [5] *BSC.* 16–12–73. [6] Hill, (36) [7] BM Addl MSS 29170, letter to Warren Hastings, 17–1–87. [8] There is a pleasant story of a Martine who accompanied Pearse's Dett. down to Madras in 1781, and helped as a surgeon; but there is no evidence to show that Claud Martin marched with Pearse, or took part in the Mysore War of 1781–4. *Mil. Repository* II (242). [9] Hodges (145). [10] Blunt. [11] Description, *Hastings' Journal* (106). [12] *Aberdeen Journal.* Notes & Queries, 28–10–1908. [13] 31–5–1809. [14] MPC. Feb. 1795. [15] In June 1806 he writes that he has been employed on survey "the last 12½ years". MPC. 8–7–1806.

best days...and which must certainly tend to shorten and imbitter the remaining few. ... The only profit I can expect from a contract, is that if I should be fortunate enough to enjoy a good state of health throughout, aided by the experience I have had, I might be able to complete it in less time".

He further pointed out that he was not nearly so well off as gentlemen of the army "as they, being attached to the army, in cases of ill health can have leave of absence to Europe if necessary for its recovery, without prejudice to their rank, whilst I must remain in a distressing and unprovided situation perhaps. ... No salary, however liberal, will induce a man, independent of some future prospect, to follow up a pursuit attended with such fatigue and risk of health, with that promptitude and alacrity, which is necessary to give it full effect; on the contrary when emolument increases with labor, it's done cheerfully and with zeal. ...

"I am not arrived at that age which requires ease, neither am I in circumstances to admit of it, and am therefore determined, if encouragement is held out, to persevere in what I consider a good cause"[1].

His request was supported by Read, "The entering in to a contract with him may be the way to ensure the speedier completion of his undertaking, and the giving him a monthly allowance may be that of ensuring its being done with the greater correctness. These observations, however, apply not to him in particular (for great dependance may be placed on his fidelity), but to mankind in General; at all events I hope you will secure him for the public service, for in my opinion he is a most valuable servant. Surveying being a laborious business, and necessarily requiring a man to visit very unhealthy and dangerous situations, and Mr. Mather having suffered already very much from it while he has been in my service, he is naturally anxious to procure a certain livelihood, and with that view alone, has desired he may be appointed an ensign in the Company's service. I am sensible that he cannot be appointed in this country, but if it can be obtained for him at your recommendation, I earnestly hope it may be done. The work he is to lay before you is the best recommendation of him, because it is such a substantial testimony of his merit, but the exertion of some influence is necessary to draw the attention of Government to it, or him. He has done his duty with me, and having done all for him in my power I commit him to your protection"[2].

Mather laid this letter and his Salem survey before Mackenzie and the Comnrs. in charge of Mysore, and obtained a letter from Arthur Wellesley recommending him to be appd. asst. on the forthcoming survey of Mysore. The GG. approved but considered "the allowance which Mr. Mather receives in the revenue Dept. sufficient as a permanent salary; a farther reward may hereafter be bestowed, if his assiduity shall continue to deserve such an indulgence", on which Mather wrote to Mackenzie. "I had every reason to expect from the zeal and diligence I had formerly manifested, and the injury my health had sustained, the Government would have felt more disposed to forward my views in a point of salary. ... A salary of 50 Pagodas will barely furnish necessaries and conveniences of life sufficient to support constitution healthy and vigorous, under such fatigues with servants, Horses, and Keepers, and the hire of coolies, which last being constantly in motion falls very heavy indeed, seldom less than 15 or 16 Pagodas per month[3].

To Mather's repeated request for permanent provision in case of losing his health, Government replied "Mr. Mather seems to be too diffident of the liberality of Govt. towards him, after the Assurances which have already been conveyed to him".

An account of Mather's services on the Mysore survey will be given in another volume; he had to resign owing to ill-health at the end of 1806, and was granted the pension he had been so anxious about. He did not, however, live to enjoy it; sailing from Madras at the end of February 1807, he was shipwrecked and drowned off the English coast in March 1808 [268].

MAXTONE, Charles. Mad. Civ.
bapt. 2–11–52. d. 24–3–1809. at Madras, aged 56.

Writer, 1769 ... Senior Merch. 1780.

Natural son of James Maxtone, 11th laird of Cultoquhey, by Janet Thomson of Foulis, in Perthshire.

m., Vizagapatam, 2–4–83, Miss Eliza Caroline Russell, dau. of David Russell; four of his daus. m. Mad. civilians, and two sons joined Mad. Army.

1775, Asst. at Vizagapatam and, at Johnston's request and by authority of the Madras Council, was sent out to assist on survey [93]. On Johnston's withdrawal at the end of 1776 [342], instruments were left behind for Maxtone's use, and he completed the survey of several *parganas* and *zamindaris* [143–4, 203, 272].

3–10–80, Wounded during mutiny of sepoys of the Circār Batt. who objected to being send to serve away from Vizagapatam against Haidar Ali.

23–10–82, Astr. obsns. for long. in company with Pearse [155].

2nd in Council at Vizagapatam 1788, and later became Judge of the Sudder Court at Madras, holding this appt. till death. MI. at St. Mary's Cem. Madras.

MAXWELL, Hugh. Mad. Civ.
d. 27–10–91, at Madras; MI.

Son of Mary Maxwell.

Apptd. Supt. Company's Lands, Madras; surveys of roads & properties [94].

McCLUER, John. Bom. Mar.
d. *c.* 1796, unm.

1st Lieut. 8–1–84.

DNB.; *DIB.*; Markham (5–6).

1786–90, Survd. W. coast of India, in comd. of *Experiment* [6, 124–5, 178, 203]; *v. Account of the Navigation between India and the Gulf of Persia.* London, 1786.

1790, sent to survey Pelew Is. and New Guinea, sailing from Bombay in *Panther* 20–8–90; McCluer Inlet at west end of New Guinea is named after him.

1793, submitted resignation in letter which *Panther* carried to Bombay, and thus explained his wish to stay amongst the Pelew islanders;

"From the many contentions which we in a manner have occasioned, by introducing things of value among them, they are now constantly at variance with each other, and are absolutely in need of some person to advise them and regulate their conduct to prevent them murdering each other; this task no one could be better provided for than myself, and I have the vanity to think I have sagacity enough to conduct, and instruct, the Natives in the most useful branch of agriculture; and, they being well disposed towards me, I make no doubt in the Plan I have formed but to succeed"[4].

[1] MMC. 27–8–99. [2] MMC. 27–8–99. [3] MMC. 6–11–99. [4] Bo PC. 20–8–93.

After two years he wearied of the life and asked to be re-instated in the service, but was lost at sea on his journey towards India.

McGOWAN, John. Ben. Inf.
d. 30–6–98, Cawnpore.

Ens. 15–5–66 ... Col. 26–2–95.

m., Mary —; Father of Suetonius McGowan of Ben. Inf. Hodson; *As AR.* I (178).

Comn. from the ranks after Batta Mutiny of 1766.

1778, Granted permission to maintain channel down Cossimbāzār R. fit for navigation, and to collect tolls. To complaints of collecting tolls without improving navigation as promised, he retorted, "Upon the faith of your Councils, I commenced this great undertaking, having for the last 15 months been employed on it; in taking accurate surveys & a level of both Rivers; in removing some particular obstructions; ...I am not an idle Adventurer"[1].

After much discussion, the Council agreed that he "be appointed to survey the Ganges & Cossimbazar Rivers with the usual allowances granted to Surveyors", and his right to collect tolls was withdrawn [63].

1781, with 1st. Eur. Bri. in 2nd. Mysore War, marching with Pearse's Dett [40].

CG. 4–10–87; A few days ago Maj. McGowan was suddenly siezed with every symptom of having been poisoned; relief was fortunately at hand and we are happy to hear that the Major is in a fair way of recovery. The cause was immediately known to have arisen from the Major's having eaten of a dish prepared in a dirty copper vessel".

1794, March, Comdg. at Anupshahr;[2] Oct., Comdg. Left Bri. at battle of Bitaurah, Rampur State, 2nd. Rohilla War.

MITCHELL, Archibald. Mad. Engrs.

Maj. (from RA.) 15–9–70; Resd. 10–3–74.

Bro. to Capt. Alexander Mitchell (d. 17–4–74) of Mad. Engrs.

m., Madras, 4–9–71, Mary Jane, sister of J. L. Wittever (or Whitever), Mad. Engrs.

31–10–64, Appd. Company's Engr. at St. Helena, 1771;[3] in charge of works at Masulipatam; 1772, Plan of the Masulipatam Circārs [92].

MONCRIEFF, Bryce. Bom. Engrs.
b. *c.* 1766. d. 10–1–1802, Bombay.

Ens. (Inf.) 26–7–85; (Engrs.) 14–1–91; ... Capt. Lieut. 8–1–96.

Bo S & Pol. 3–4–90, Attd. as Engr. to Bombay dett. sent to Malabar under Lt Col. Hartley [130].

Bo. MC. 20–11–92, Suspended by the Bom. Govt. for misconduct; two letters, dated 17–2 and 1–3–91, appeared in an English newspaper, the Argus of 28–9–91, "signed B.M., an engineer in General Abercromby's Army on the Malabar Coast", which, on reaching India, were laid before the Council by the Governor, General Abercromby himself, as "containing the grossest expressions on his character and conduct, as well as the measures of Government during the late War".

When challenged as to the authorship, Moncrieff replied: "I can only say that whenever I wrote my opinion on what was going on, it was in confidence to a particular friend, and under the impression that any opinion given on such subjects by a person in so very inferior a station could never be considered as having any weight. I beg leave to express my sense of the candour with which the General has communicated a subject which appears so very much to my prejudice".—"By which the Board observe that although Mr. Moncrieff does not acknowledge being the Author of the said letter...yet he does not deny it; ... it is evident that he has corresponded by his private letters upon the public affairs of the Company, and has thereby been guilty of disobedience of the orders of the Hon'ble Court of Directors, ... and, as he has not thought proper to retract or make any apology for the expression tending to the hurt and dishonour of the Commander-in-Chief..., "Resolved therefore that he be suspended the service until the pleasure of the Honourable Company is known; ... we are of opinion that Mr. Moncrieff's writing this libel was occasioned by pique and disappointment in not being confirmed in the Staff Office of Pioneers, which the Hon'ble the President in Council deemed an unnecessary expence".

The Council at the same time refused an application from Moncrieff for special allowance as "Captain of Pioneers to the Detachment, the duties of which became particularly severe from the early season at which the Detachment marched, and through to a Country where it was but seldom there were any traces of a Gun road to be found".

On receipt of orders for his suspension, Moncrieff submitted a letter expressing "his deepest contrition for the erroneous aspersions contained in his letter"; .. "Practitioner-Engineer Moncrieff is free to confess that the animadversion he unhappily cast upon the Commander-in-Chief's character and actions...were founded on a hasty undigested view of circumstances, stimulated by a too sudden impression of a recent disappointment on his joining the Army"[4].

He applied for leave, Calicut, 23–1–93; "Finding I cannot be employed until the decision of the Hon'ble the Court of Directors on my suspension can arrive, and my health having suffered from severe and frequent attacks of a fever, I am desirous of trying the effects of a cold climate, [and] should be happy of your permission to proceed to Europe"[5]. He did not take advantage of the leave sanctioned, but stayed on in Malabar[6], and was employed on surveys [131].

27–12–93, Col. Hartley wrote to him; "As you have been so obliging as to offer your services in the line of your profession, ...I have therefore to request that you will be so good as to proceed into that District (Rayamulla) for the purpose of surveying the same, examining accurately the River and forming an opinion respecting the most eligible site for establishing the Post"[7].

May 1794, at Bombay, reported that he had been employed on the construction of Barracks at Tellicherry, Cannanore, etc., and in Nov. asked that he might receive pay for the period of suspension. Reinstated Sept. 1794, but not brought on to full pay as there was no vacancy.

May 1795, the CE. asked that "As I am very much in want of an officer, ... Ensign Bryce Moncrieff may be ordered to do duty, as he is at present quite unemployed", and orders were issued that he should be granted the same pay and allowances during the period of his suspension which he would have received had the measure not taken place[8].

Bo MC. 9–10–95, Appd. to "carry on the survey in the Province of Malabar, in the room of" Emmitt, and during 1796 employed on detailed surveys in Ponnani Dist. [7, 132].

16–2–96, Appd. asst. to the SG., again in the room of Emmitt, but could not be spared from Malabar, and in March 1797 was appd. to comd. the newly formed Corps of Pioneers [273].

[1] BPC. 31–5–79. [2] 53 L/7. [3] CM. 31–10–64. [4] Bo MC. 4–1–93. [5] Bo MC. 15–3–93. [6] Bo to CD. 13–1–94 (25). [7] Bo MC. 17 (1795) pp. 907–9. [8] Bo MC. 18–9–95.

In this capacity he took part in the 4th Mysore War, measuring the road from Cannanore to Seringapatam [118], and holding charge of the Guides and intelligence corps.

After the war he took up the survey of Sonda and Kanara, ceded to the Company, but was interrupted by operations against the Pychy Rāja of Kottayam [132], who held out against the British for several years[1]. Wellesley took over command early in 1800, and wrote, 13–4–1800, "It is, however, absolutely necessary that the Pyche Rājah should be closely watched during the monsoon; no person is so fit as Captain Moncrieff to have the charge of those who will give intelligence of him. ... I have had great satisfaction in observing the zeal and intelligence of Captain Moncrieff"[2].

Road making by the Pioneers, and maps, were amongst Moncrieff's first responsibilities in this difficult and unknown tract, and in submitting a general description of the country and its roads he writes; "I am sorry that time will not admit of my furnishing...the Hon. Col. Wellesley with a sketch of Cotiote and Wynaad; my original survey in those districts was carried of when my House at Calicut was plundered; and the compiling the papers which I am still in Possession of will require more time than the present occasion will admit of. ... Colonel Close is in possession of the Map of those Districts which I furnished General Stewart with"[3].

During the cold weather of 1800–1 Moncrieff was with Col. Stevenson's force in the Wynād [131], and was then granted a few months' leave to Bombay, obtaining an extension in order to visit Surat and help the S G. with his map [218–9]. Whilst he did been kept in Malabar, Reynolds had been striving without success to procure his services at Surat, and even now his appeal for their further extension was rejected, for Wellesley writes to the Governor, Nov. 5th, "Captain Moncrieff will have informed you ...that I have given the leave for which you wish. I hope, however, for his own sake as well as for that of the public, that he will not be induced to remain at Bombay, or Surat, longer than is absolutely necessary to complete Lt Col. Reynolds' map"[4].

He left Surat 6–10–1801, but got no further than Bombay; his health had been seriously undermined by long service in Malabar, and he died in Bombay Jan. 10th 1802"[5].

MONSERRATE, Father Anthony. S J.
b. 1536. d. 5–3–1600, Salsette, Goa
[pl. 9].

b. at Vic de Ozona, 30 m. from Monserrat[6] in Catalonia, Spain.

SJ. Jan. 1558.

1574, Left for India; 17–11–79, left Goa with mission to court of Akbar; landed at Damān and thence travelled by land to Surat; leaving Surat 15–1–80, mission reached Fatehpur Sikri, a distance of 650 m. after 43 days, travelling by way of Taloda, Māndu, Ujjain, Sironj, and Narwār [pl. 10], where Monserrate was detained some days by sickness[7].

The mission was well received by Akbar, who took Monserrate on march to Kābul in 1581, in capacity of tutor to his second son Prince Murad; left Fatehpur Sikri 8–2–81, and returned 1–12–81; Monserrate himself did not reach Kābul, being left behind at Jalālābād in bad health [149].

The following year he was member of embassy which Akbar despatched to Europe, though it did not get beyond Goa.

1589, on mission to Abyssinia; captured on the way by Arabs, sent to the galleys, and not released till 1596; died four years later.

On journey up from Surat in 1780, kept a survey and took obsns. for latitude, taking further obsns. on road to Kābul which was measured under Akbar's orders [10, 234 n. 3]. No record of these surveys was known to D'Anville or Rennell, and they were first noticed by Thomas Call in 1784 [11].

Besides other papers Monserrate left a most interesting account of his journeys and stay at Akbar's court, entitled *Mongolicæ Legationis Commentarius*[8]; which contains not only a list of geographical positions but also a small map of India that is reproduced on pl. 10 [209, 232].

The romantic story of the discovery of this MS. in Calcutta, 1906, is given in full, with the Latin text, the list of lats. and longs., and the map, in a paper by Father Hosten in the *Journal of the Asiatic Society of Bengal*. Hosten describes various pencil remarks made in the margins, and discusses the possibility of these being made by Wilford [qv] who was in possession of some of Monserrate's writings, but finds that none of Wilford's many quotations agree exactly with the Calcutta MS[9]; we may also note that Monserrate's latitude of Attock, 33° 41′, quoted by Wilford [149], does not appear in the Calcutta MS.

Hosten moreover does not notice that Wilford presented to the library of the Asiatic Society, between 1820 and 1822, "Commentaries of Padre Monserrat, autograph, 2 vols"[10]; these cannot now be found, but they obviously did not include the volume found in 1906; the title Wilford gives in one of his quotations is *De Legatione Mongolica*.

It is possible that the pencil comments described by Father Hosten were made by Thomas Call, and if so, then a comparison of handwriting might well be made with records now preserved with the Survey of India or the Imperial Records Department. It is to be noted, however, that Call must have had some maps and papers that are not contained in Hosten's MS, which makes no mention of *compass survey* or *observation for latitude* as described by Call.

[1] Operations described by Innes (79–81) & Logan (533–48). [2] *Supply. Desps.* I (520); other letters about Moncrieff & his Pioneers, ib. I (20, 49, 118, 192 &c.). [3] H M S. 458 (245). [4] *Supply. Desps.* II (612). [5] Ob. notice, *Bom. Courier* 16–1–1802. M I. Sonapur Cem. [6] Hence called *de* Monserrate by some writers. [7] Maclagan (26); Smith (171–3). [8] *Commentarius*; English translation given in the *Catholic Herald of India* Aug. 1920 & Nov. 1921. [9] *Commentarius* (515–28) & *JASB. XVIII.* 1922 (371–4). [10] *As R.* xiv. 1822. Appx. II.

There is another writing of Monserrate's in existence, an abstract from his diary, of which several copies were made at Goa in 1582. This is entitled *Relacam do Equabar Rei dos Mogores*, an English translation of which was published by Hosten in 1912; this contains nothing whatever about Monserrate's journeys, geography, or survey[1].

References to Monserrate and his writings will be found in Maclagan; Smith; *JASB.* VIII (185–221); XVII (371–4); *AsR.* IX Errata & Addenda; XIV (454, App. ii); *Commentarius; Ben P&P.* VIII (219); XIII (297, 313); *New Magazine*, Calcutta, Dec. 1939, No. 60. X (437–86).

MONTRESOR, Henry Amand. Mad. Engrs. & Inf.

b. *c.* 1745. d. 10–9–73, Tanjore.

Lieut. (Engrs. & Inf.) 8–9–67; Resd. Engrs. 26–1–69; Capt. (Engrs. & Inf.) 25–6–70.

Son of James Gabriel Montresor, HM's Engrs. (Ens. 5–4–32 ... Col. 25–5–72; *DNB.*), and his 1st. wife Mary, of Thurland Hall, Notts.

m., Madras, 2–10–70, Miss Frances Cleverly; left a son, Henry Eyre, and a dau. Frances.

Lieut. "of H.M.'s 14th Regt. of Foot, who, on the reduction of the youngest Lieutenants in the Regiments in the year 1763, was reduced and placed upon half-pay; but he, being an active disposition, and desirous of serving his King & Country, memorialized...in 1767...for leave to serve in the EIC.'s service, until he should be ordered back into his Sovereign's service, all of which was readily granted, and to retain his half-pay"[2].

1767, Appd. by Directors to be sub-Engr. & Lieut. from date of arrival in Madras, "of whose qualifications as an Engineer we have received ample testimonials; ...having served the Crown in that Branch in the Last War."[3].

Arrd. Madras during 1st Mysore War [89, 91], when it was resolved that "Mr. Henry Montresor, who came out with the rank of Sub-Engineer and Lieutenant shall have a commission given as a Sub-Engineer and Lieutenant in the Infantry and that he be ordered to proceed to act in the Field where most required"[4]. Served before Kolar [342], and, 23–6–68, was "shot in the arm, but the ball was extracted"[5].

The allowances and prospects of Engr. officers were in those days not so good as those of the Inf. [266, 272], and when the Directors ordered that officers should not hold appts. in more than one corps, Montresor surrendered his Engr. rank, the Council noting "that he cannot retain both Military rank, and position as Engineer. He was already appointed Lieutenant in the Military line, in consequence of our great want of officers to send to the Northward, and it being thought he might be useful in both capacities. He may continue in the Military Line only" [272][6]. As he is a very capable and deserving young man, he is to be mentioned in a favourable manner to Court of Directors[6].

10–6–69, Reported fit for duty and appd. to superintend the Works in Madras, and on Call's departure the following Feb., took charge of the Engrs Dept. Whilst holding this charge he compiled a *Map of the Peninsula of India*, [3, 98, 239], on which the Council remarked. "Taking into consideration the pains and trouble Mr. Montresor must have had compiling the above plan, together with his great merit & abilities in other respects, having had the charge of the works at this place ever since Mr. Call's departure, in which his conduct hath been much to our Satisfaction, we could wish it were in our power to make him some recompense adequate to his merits, and as his services in the Engineering Branch are much wanted at this time, it is agreed to ask him to continue in that Corps until we can advise the Court of Directors; in the meantime a commission as sub-Director & Captain of Engineers be given to him to rank from this day"[7].

Before this appt., the Corps of Engrs. in Madras had fallen to only two officers [272], and in 1770 the Directors sent out a number of officers from England. In June 1771 Montresor complained of his "supersession by Capt. Pittman in the care of the Contract Buildings", and the Board had to explain that his appt. had been made "owing to the known coolness that existed between Capt. Henry Montresor and the CE., Lt.-Col. Ross [94]"[8].

Oct. 1771, at the siege of Tanjore "much indisposed from a musket ball which grazed his head"[9].

1772, with other officers employed on survey of the routes of the detts. operating against *poligars* of Marawar[10] and Tinnivelly [90]. After completing "the Survey from the North gate of Madura to the South gate of Trichinopoly...I have also taken particular sketches of the villages. ... As the monsoon is now setting in, I am led to think I shall not be wanted in the field for some time...", so asks for leave to go to the Presdy. [94][11].

About this time his name was put forward for charge of a survey of the Carnatic [90], but during the seige of Tanjore in Sept. 1773, the C-in-C., after reporting that Montresor was dangerously ill, had later to report his death.

5–2–76, His widow was admitted a pensioner of Lord Clive's Fund and, 13–12–80, petitioned for further help, writing, "He was taken very ill in camp at Tanjore before he had an opportunity of making any provision for his Family, and died...leaving his disconsolate widow in a strange Country, and in very indigent circumstances with two young children, all in very great distress"[12].

MORRISON, Dennis. Ben. Inf.

d. 5–3–76, Calcutta.

Ens. 1–5–64 ... Capt. 1–12–67; Dismd. by ctml. 7–10–71.

Came to India as midshipman in HMS. *Medway*, consort to HMS. *America* in which Rennell also was midshipman.

Feb. 1766, Comdg. a small dett. of sepoys sent against *sanyāsi fakīrs* on the borders of Rangpur and Cooch Behār, where he was supported in action by Rennell [292, 300].

Made "cursory surveys" in Balasore, Burdwān, and Midnapore, probably before 1766 [21]. obsd. for lat. at "Jellasore, Adjudagur, Cossimbazar, Moorshidabad, Sourie", and other places[13].

1767, survd. route across Rājmahāl Hills, North of Dumka.

12–11–70, Killed John Campbell, of Ben. Inf. in duel at Monghyr, tried by GCM. 20–12–70, and acquitted. Dismd. by Ctml. 7–10–71, and became Capt. of a country ship.

[1] *JASB.* viii. 1912 (185–221). [2] Widow's petition, 13–12–80, I O Misc. 25 (75). [3] C D to M. 4–3–67 (35). [4] M M C. 27–11–67. [5] Vibart. I (101). [6] M M C. 26–1–69. [7] M M C. 25–6–70. [8] M P C. 17–6–71. [9] Vibart. I (115). [10] Ramnad, 58 K [pl. 9]. [11] M M C. 9–11–72. [12] I O Misc. 25 (75). [13] Orme MSS. 67 (25).

MOTTE, Thomas. Ben. ; Free Merch.
b. *c.* 1730. d. 29–1–1805, Serampore.

m., Calcutta, 5–1–79, Miss Mary Touchet.
BPC. 13–5–62 *et seq.*, Dispute over plot of land at Murshidābād.
BSC. 4–7–65 *et seq.*, Protested against having to surrender the farming of rents in Burdwān, consequent on withdrawal of licenses to free merchants.

1766, Sent on mission to Sambalpur by Clive, and survd. route from Cuttack. Left Calcutta 13–3–66; arrd. Balasore 27–4–46, Cuttack 6–5–66, Baud 22–5–66, Sambalpur 31–5–66. Had many adventures, but returned in Oct. without any success, either in political negotiations or in Clive's private business in diamonds. Wrote account of his journey, pub. 1799 [30, 39].

1770, Trading in diamonds at Benares[1], and in 1774 said to have "had an appointment of late under the post Master for receiving & dispatching the Dawks at Benares [304]".

BPC. 21–8–75, Ordered to withdraw from Oudh, but pleaded for time "as he has business at Mirzapore, and trade to value of 16 Lacks to be settled up".

1777, Moving in the highest circles in Calcutta, having Philip Francis and Lady Impey to breakfast and dinner on May 18th[2]. 10–3–78, Writes to Warren Hastings from Hooghly saying that he had been on the sick list[3].

BPC. 31–5–79, Appd. Supt. of Police but, in spite of substantial salary of £2,000 a year attached to that post, he was in Sept. 1780 "in pecuniary difficulties, and his house in Calcutta is advertised for sale on October 3rd".

Jan. 1784, his wife, a close personal friend of Mrs. Hastings, accompanied her to England and never rejoined her husband[4].

1785, Salary as Supt. of Police was, like that of many other officers, retrenched from £2,000 a year to £800[5]; about this time he passed through the bankruptcy court, and his many letters to Warren Hastings in England, tell mostly of misery and disaster; he had lost his post in the police by 1792, and was "obliged to live at Serampore[6] to avoid his creditors."

Feb. 1796, wrote from Serampore congratulating Hastings on the result of the trial, and a letter of 1802 mentions that "poor Motte is well and cheerful, but breaking, and his faculties a little impaired"[7].

MOUAT, James. Ben. Engrs.
b. *c.* 1765–6. d. 9–5–1829, at sea.

Ens. 19–7–82 ... Lt Col. 29–5–1824.
Son of Dr. George Mouat, Surg. HM.'s 13th Dragoons.
Succeeded his bro. as Bart. of Inglistoun, 1825; of the house of Mowat, of Balquholly, and of York Terrace, Regent's Park, London.
m. Edinburgh, 5–9–1809, Wilhelmina, dau. of Capt. George Mouat, RN. Father of Sir James Anbury Mouat, Ben. Inf.
July 1787, Asst. Engr., Chunār; 1794, 2nd Rohilla War; ADC. to Sir Robert Abercromby, C-in-C.

19–11–94, Appd. Survr. in the Field, and survd. boundary of the present Rāmpur State, and line along foot-hills from the Rāmganga R. to Hardwār. [8, 55–6, 167–8, 188, 232]. Nov. 1796, permitted "to come to the Presidency preparatory to proceeding to Europe on furlo' for the benefit of his health"[8]; furl. 27–3–97, till 16–12–1800.

Feb. 1803, Asst. Professor of Hindustani at College of Ft. William, and succeeded Gilchrist as Professor, 1804–8[9]; Furl. 1808–10.

1812–13, at PWI., Penang.

18–9–1813, suspended till the pleasure of the Directors be known, for "having attempted to dispose of an English horse to the Nawab of Bengal for one lakh of Rupees"[10].

The story is worth telling.
In Jan. 1813 the Nawāb's *vaqil*, hearing that Mouat's horses and carriages were for sale, waited on him in Calcutta, and reported the following terms to the Nawāb in Murshidābād;

"A Europe-made Chariot & Harness	...	Rs. 10,000
Curricle with a pair of Harness [horses ?]		3,000
A Neezde [Arab] Horse	...	5,000
A large spotted Europe Dog [Dalmatian ?]		2,000

"Also a Europe Horse from London, of which the Major does not specify the price. He says that His Excellency the Wizier [of Oudh] and the Rajah of Bhurtpore were willing to give him a lac of Rupees for it, but that he would not give the Horse for that price; that now however the Wakeel from the Rajah of Nepaul has promised to purchase him, and that he will sell him to the first person who will purchase"[11].

Mouat claimed that the *vaqil* agreed to the purchase, but the Nawāb denied this, and on Mouat pressing him, referred the matter to his English Superintendent who took a serious view of the matter. Mouat stuck to his claim that the bargain had been concluded and was perfectly reasonable, and threatened legal proceedings. On being challenged by Govt. he requested an honest trial by ctml. The Advocate General advised Govt. that the case was not cognizable.

The GG. reduced the case to "the Broad and Simple Fact of his attempt to obtain the enormous Sum of a lac of Rupees for his English Horse, which in my opinion is a very Fraudulent proceeding on his part, doubly odious in a person of the Honorable Profession to which he belongs. This Fact Major Mouat has repeatedly acknowledged in the fullest manner under his own Hand"[12].

The Council accordingly placed Mouat under suspension and referred the case to the Directors, giving Mouat permission to proceed home to plead his case in person.

The Directors sent out their orders two years later; "We can by no means admit that the Advocate General's opinion... was correctly founded. Nothing is more common than the Trial of Officers by Courtmartial for un-officer—and ungentleman-like behaviour, such as Major Mouat was directly charged with by you, namely Acts of fraud and extortion, and it appears to us that the only way of arriving at the truth would have been by an open and public enquiry.

"Although we consider the Governor General in Council to have been justified in suspending Major Mouat from the service, yet as no Courtmartial took place, ... and in consideration of his long service and good conduct previous to the transaction in question, notwithstanding we highly disapprove the whole of his proceedings therein, we have resolved that the suspension of Major Mouat be removed, and that he be permitted to return to his duty"[13].

Held various other appts. till his death on board the *Prince Regent* on his voyage to England.

MOULTON, John. Ben. Inf.
b. 27–9–48. d. 16–6–83, Barrackpore.

Ens. 26–9–70 ... Capt. 6–2–81.
Son of Rachel Moulton of the City of London; bro. of Stephen Moulton, of Chancery Lane.
Ed. Merch. Taylors', 1756–60.
1st Rohilla War, 1774.

[1] Grier (50); diamonds were much used for making remittances to Europe. [2] Francis. I (281). [3] B M Addl MSS. 29140 (180). [4] ib. (181); *Beloved Marian (passim)*. [5] H M S. 79 (460). [6] A Danish settlement, sold to the Company in 1845. [7] Grier (434–5). [8] G O. 14–11–96. [9] B P C. 8–1–1808. [10] Carey (250) [11] B Pol C. 17–9–13 (69). [12] ib. 1–10–13 (79). [13] C D to B. 20–9–15 (6, 7).

BPC. 5–12–76, Recommended by Rennell to be asst. to the survr. in Oudh, & Allahābād [36].

Aug. 1779, Submitted from Lucknow a number of routes survd. in Oudh, the Doāb, and Bundelkhand [37].

Date unknown, Survd. "part of the Pargannas north of Calcutta"[1]. 4–7–81, Comdd. batt. at capture of Chinsura.

NICOL, James. Ben. Inf.
d. 4–3–1816, at the Cape of Good Hope.

Ens. 14–11–61 ... Capt. 20–12–64. Resd. May 1766; Restored, July 1780; Lt Gen. 25–9–1803; Ret. 1–7–1804.

1761–3, Attd. to Knox's force in Midnapore, and employed on surveys south to Balasore [21, 28]. July 1763, with Knox to Patna; frequently employed on surveys [28].

March 1764, "Lt. Nicolls was appointed to survey and lay out the line of the entrenchment"; army was withdrawn to Patna; Lt. Nicolls "was sent in advance to examine ford across the Soane", but army diverted to Dinapore. Enemy were approaching and "Lt. N. was given up for lost, but having succeeded in surveying the ford, he arrived in camp several days after"[2].

At the battle of Buxar, "Capt. Jennings and Lt. Nicoll had formerly been employed under Maj. Carnac in surveying the ground now occupied by the enemy, and were well acquainted with the locality" [341].

"When Major Munro ordered it [1st Batt.] to advance to attack in flank a battery, ... Lieutenant James Nicol...being a lieutenant in the battalion, but acting Adjutant to the Sepoy corps, and as such rode in the suite of the Commander-in-Chief, immediately dismounted, and gallantly led his battalion forward; but he was driven back with considerable loss, and the corps thrown into great confusion; however he soon rallied his men, and kept up with the front until the enemy were defeated"[3]. Mentioned in orders and thanked by the President in Council.

1765, with Carnac to Lucknow in comd. of his bodyguard, and left there, 14–9–65, in charge of the batt. doing guard to the Nawāb-Wazīr[4].

1766, In comd. of the 15th Sipahi Batt. with 3rd Bri. at Serajpore, where Col. Smith was expecting to be attacked by a force of Marāthas. On May 7th the majority of the English officers submitted a letter resigning their commissions, Nicol among them. This was part of a concerted plan amongst the officers of the three brigades on field service, intended as a protest against conditions of service, but more especially against a recent order of the President in Council revoking the custom of allowing double batta for service beyond the Presdy. town [275 n. 7].

Nicol was one of the leading spirits of this "Batta Mutiny", and when the Council accepted the resignations and ordered the offenders down to Calcutta, he continued to show a defiant spirit. He first went to Benares and started in private trade, and in Dec. 1766 withdrew to Fyzābād. From this place he was eventually arrested, sent down to Calcutta in custody, and, Dec. 1767, shipped to England, where he found a warm champion in the author Caraccioli, who in his *Life of Robert Clive* makes Nicol out to have been much maltreated[5].

1780, Restored by the Directors to rank of Captain, and thereafter had distinguished military career, comdg. a bri. during the 3rd Mysore War and rising to the rank of Maj. General.

NORRIS, John. Mad. Engrs.
b. *c.* 1760. d. 28–1–1817.

Ens. Inf. 3–10–81; tr. to Engrs. 1782; ... Lt Col. 1–1–1803; Ret. 25–9–1811.

m., Vellore, Lydia, eldest dau. of Wm. Harcourt Torriano [94 n. 10].

1–7–82, Applied for tr. to Engrs. "to assist Captain Johnston [342] at Negapatam"[6].

M M C. 3–5–85, it was ruled that "Mr. Norris, who is employed on surveying, can ill be spared from this service to destroy the Fortifications at Amboor". 3–6–87, CE. reports that "Mr. Norris has given general satisfaction on the Survey in which he has been engaged". 1788–91, and probably longer, Employed under Board of Revenue on survey of "grounds for new settlers in the Madras Jaghire" [143, 273].

Jan. 1794, Deputed to survey Devicottai "having no material duty to perform at Fort St. George", remaining on this duty till May 1795 [108][7].

From 1795 employed on normal Engr. duties. Being stationed at Seringapatam in 1799, became involved in a dispute about a map with Col. Wellesley, who wrote to him, "In the conversation which passed between you and me yesterday, in the course of which you told me that you would not furnish me with a plan of Seringapatam, either for the Military Board or for my own use, I wrote you a letter, which I delivered into your hands, in which I desired to have both". Norris "replied verbally that all plans were to go to the Chief Engineer, and from him to the Military Board, and that he would not furnish me with one".

Wellesley thereupon reported Norris as "unfit to be employed as Engineer at Seringapatam"[8]. Though Govt. agreed that Norris was in the right, he was transferred from Seringapatam so that he might not offend the great man again[9].

NUTHALL, Thomas. Mad. Cav.
b. 1755–6. d. 14–8–1829.

Cornet 10–12–85 ... Col. 12–8–1819.

Son of Sir Thomas Nuthall, Solicitor to the Treasury. (*DNB.*).

m., 1st., Madras, 21–9–95, Eleanor Bromley, who d. Madras 1–9–97.

m., 2nd., Devonshire, Charlotte, dau. of P. R. Webber.

Oct. 1792, Survd. route from Arcott through Ongole to Hyderābād [116][10].

ORME, Robert. Mad. Civ. & Historian.
b. 25–12–28, at Anjengo. d. 13–1–1801.

Writer, Bengal, 1743; tr. to Mad. 1754; Member of Council; Commy & Acctt. Gen. 1757–8; Ret. 1759.

Son of Alexander Orme[11], Surg. & Chief of Anjengo [96 n. 1]; when about 2 years old, sent home to an aunt in Cavendish Sq. London. Ed. Harrow, 1734–41.

DNB.; *DIB.*; Holzman (135); *Eur. Mag.* 39, 1801, with portrait [pl. 18].

1742, Arrd. Calcutta in the employ of a mercantile firm. Patron of Dalrymple at Madras [330].

[1] B P C. 29–3–87. [2] Broome (434). [3] Williams (136–7). [4] Caraccioli. I (472). [5] See also Bolts [223 n. 10]. [6] Mack MSS. LXVIII. [7] ib. LXIX. [8] *Supply. Desps.* I (275), 19–7–99. [9] Vibart. [10] DDn. 266 (140). [11] Innes (504).

On voyage home, 1758–9, captured by the French near Cape of Good Hope, and taken to France, reaching England Oct. 1760. Purchased house in Harley St. and settled down to write his History; Vol I. appearing 1763, Vol. II, 1778. From about 1768, Histriographer to EIC. on salary of £ 400 a year.

In his case History and Geography went ever hand in hand, and all his correspondence shows that he was just as persistent in asking for maps and sketches and geographical information as he was in asking for facts and narratives. He wrote to all his friends, civil and military, in Madras and Bengal, begging for all the information and maps they could collect, and it was his request to Clive in 1764 that initiated Rennell's great survey of Bengal [29, 222, 256]. A number of his letters written to Clive between 1765 and 1767 are preserved at Powis Castle.

Not finding any general map of India suitable of illustrate his History, he compiled one of his own, his chief dman. being Thomas Kitchen [211]. Amongst his papers now preserved at the India Office are details regarding the projection of this map, and astr. positions for control [153, 223]. The map is produced in different forms in Vol. III of his *History of the Military Transactions of the British Nation in Indoostan, from the* year 1745 [87], and again in his *Historical Tragments of the Mogul Empire from 1659* [211–2]. The 2nd. edn. of this latter work, 1805, contains a brief biography.

Amongst his correspondence are many letters to and from D'Anville who showed the greatest interest in his work [211, 331]. He paid his respects to the Marquis de Bussy during a visit to Paris in 1773 [115, 320].

ORPEN, Richard Thomas. Mad. Civ.

Writer, 1778. At home in 1787. d. unm.

Son of Rev. Richard Orpen, of Killowen, co. Kerry, & Mary his wife. After retirement High Sherriff, co. Cork.

Palamcottah, 1–1–83, Dedicated a map of Tinnivelly "to J. Sullivan Esq. [243], Resdt. &c. at Tanjore"[1]. 5 m. to an inch; map described by Montgomerie as "poor" [111].

ORR, Alexander. Mad. Inf.
b. 8–4–64. d. 14–3–1809, at sea.

Ens. 6–10–81... Lt Col. 25–7–1805; Ret. 31–1–1809.

Eldest son of Alexander & Elizabeth Orr, of Waterside, Scotland.

m., 7–12–1802, at Madras, Mary Ann, dau. of Maj Gen. Wm. Sydenham, Mad. Art.

Lost at sea with wife and 3 children in the *Lady Jane Dundas*, on homeward voyage.

3rd Mysore War, 8-11-91, with Ellore Dett., or Nizām's Subsy. Force, at capture of Gurrumkonda Ft.[2]; as Qmr. to the Dett., survd. all its marches through the Nizām's Dominion "since the beginning of 1793" till 1796 [116][3].

M. Rev. Bd. 5–1–98, Recommended for survey of Guntūr Circār, the Collector writing, "The sketches which I have seen...from Capt. Orr point to his assiduity & Qualification for his Task, & as I understand he is on the point of quitting the adjutancy and quartermastership of the 11th Regt. I...recommend his offers be accepted [115, 147]".

Beatson [311–2] wrote, 10–6–98, "I am not personally acquinted with Capt. Orr, but his correspondence with me on Geographical subjects, & the specimens of his performances, impress me with so high an opinion of his talent, that I think it is to be regretted they remain unemployed"[4].

The approach of the 4th Mysore War prevented further thought of this survey, and Orr was given comd. of the Guides [111], and frequent reference to his work during the campaign is made by Allan [308] in his *Account of the Campaign in Mysore* [111, 118][5]. 1804, Q M G. Madras.

An appreciation of his services was pub. in M G O. of 3–1–1809, just before his retirement.

PARKER, William Neville. Ben. Art.
b. 4–3–74, in India. d. 18–5–1853, Bath.

Fwkr. 6–1–92 ... Capt. 17–9–1807; Ret. 10–6–1808.

Son of Bt. Col. John Neville Parker, Ben. Inf., by his *begum*[6].

Aug. 1793, at siege of Pondicherry.

1799–1800, Surveys in southern Chittagong [59].

1803, Operations in Ganges–Jumna *doāb*. Furl. from 28–2–1805. 1811–6, Recruiting officer for EIC. in Ireland and England.

PARROTT, Richard Leveridge. Ben. Engrs.
d. 4–9–72, Monghyr.

Ens. 5–1–69; Lieut. 8–11–69.

Son of Mary Parrott.

Nothing is known of the circumstances under which he carried out a large-scale survey of Budge-Budge and the Hooghly R. [52].

PEARSE, Thomas Deane. Ben. Art.
b. 1741–2[7]. d. 15–6–89, near Calcutta.

Tr. as Maj. from RA. 2–9–68; Col. 12–6–79.

Son of Thomas Pearse of Reading, Capt. RN. (d. 1778), and Martha his wife; cousin to T. F. M. Humberstone [98 n. 13][8]. Made regular remittances from India to his father and to a sister. Ed. RMA.

m., in Calcutta, a *muslim* lady, Panna Purree, who d. 1820.

DNB.; DIB.; EIMC. II (247–50); *Mil. Repository.* I to IV; *Ben. P&P.* II (305 *et seq.*). Portrait in RA. Mess, Woolwich, and photograph of this at VM.

Fwkr. RA. 8–6–57; military service in Europe and W. Indies. Arrd. India 24–6–68; stationed at Chunār till July 1769, Succeeded to comd. of Ben. Art. 28–10–69, holding appt. till his death. He writes; "When I first came into command of the corps I was astonished at the ignorance of all who composed it", and says he "set himself to work to improve the state of the regiment, and in 1772 he had arranged for the supply of better material, and was rewarded ere his death by seeing the corps raised to a high state of discipline and efficiency"[9].

Pearse was a keen astronomer, and kept up a regular series of astr. obsns. for lat. and long. at his residence at the Treasury Gate, Ft. William, the results of which, for the period 1774–9, were pub. in *As R.* [154–5, 163, 180, 200]. He also took regular meteorological obsns., the record of which opens in

[1] M R I O. M 339; DDn. 246 (44), & M M C. 10–12–11. [2] 57 K/9. [3] H M S. 563 (85); Mack MSS. LX. & M R I O. M 163. [4] M Rev Bd. 27–7–98. [5] Sinha. [6] Muhammadan lady. [7] *DNB.* gives birth *c.* 1738, but M I. in S. Park St. cem. shows death at age 47. [8] *Mil. Repository.* II (109). [9] Buckle. (37).

Nov. 1773, and shows readings taken 3 or 4 times a day of Barometer, Hygrometer, Thermometer, and Wind, with many interesting comments;

28–1–74. "Sky clear. Saw Saturn, his ring a straight line, one satellite above him. ...

29–3–74. "It lulled & began again from the NW., then again died & freshed in the NE., horridly black the SW. from whence I expect it. During this time very little rain fell, & I was obliged to run out of my tents for fear they should fall, and my thermometers packed up for fear of breaking. ...

11–9–74. "Untill a little before Gunfire the heat was terrible, the wind was northerly, tho' I know not from what point, & it brought an horrid stench from the Brick Kiln, or town, or both. About Gunfire the dew fell heavily, the air felt cool and agreebly moist, & the wind getting round to ye Southward rendered the morning pleasant & cool: but before that, the heat was suffocating & deprived me of all sleep. ...

12–5–76. "The S.ly wind gradually died away, a lull of a minute intervened, & then came ye NW.'r which raised the dust to the clouds; as the force of ye wind increased, the clouds grew thicker & thicker, & swelled out in the middle, forming a regular curve, which seemed to be of a consistence like something solid. When this mass reached our Zenith, the storm began. While I have been writing I have several times smelt the electricity as when the matter flows from the sharp point as a conductor, & soh as a Gentleman who is with me; from which I conjecture that my Electrical rod is very much affected, for the Lightning is very frequent without Thunder. ...

16–9–76. "Thunder in ye NW. from whence a storm coming on I think I felt an earthquake in three successive shocks. About one minute ago I was reading & my attention was taken off by a motion of my chair & a repetition of it twice afterwards almost confirms me. I heard immediately after Thunder at a distance. (It was felt all over the Town)".

Pearse was a close personal friend of Warren Hastings, and acted as his second in the duel against Philip Francis, 17–8–80, reporting details to the Chairman of Directors in a letter of 4–10–80[1].

Jan. 1781, Took comd. of the force that marched down the east coast to join Eyre Coote's army against Haider Ali [4, 40–2].

The great difficulties which he had to meet during this march through the physical nature of the country, lack of discipline within the force, duels and courtmartials, sickness and cholera, and the uncertain attitude of the Marāthas, are vividly described in his letters [40–1][2]. Throughout the march to Madras, which occupied over six months, Pearse displayed all the qualities of a great leader, and it was a very great disappointment to him that on arrival, the Bengal Dett. was split up amongst the various brigades of the army; Pearse himself was given no command nor responsibilities worthy of the seniority, and was continually passed over by his juniors, and kept out of the higher commands by brevets granted to officers of King's troops. Throughout his correspondence Pearse shows strong animosity against Coote, which seems to have existed ever since the C-in-C.'s first arrival in Bengal, March 1779.

During 1782, he took a few months leave to Bengal, and on his return journey, writes the Council, "having offered to convey 20,000 Gold Mohurs[3] with his baggage for the service of the Presidency of Fort St. George, this sum was accordingly delivered to his charge. The necessity of keeping secret a trust which in Every mile of the way Might be exposed to plunder if it were known, made us withhold the entry of it upon our records, and prevented our taking any Earlier notice of it to you. ... Col. Pearse arrived and delivered his charge safely in to the Company's Treasury at Madras, acquiring in our opinion some degree of credit, both from the proposal itself, which was made at a time when the season would not admit of a safe and speedy convey by sea and from his successful execution of it"[4].

On this journey, as well as on that of the year before, Pearse had a perambulator traverse kept of his route, and took astr. obsns. at all important halts [154–5].

Took a short spell of leave after being wounded at Cudalore, writing, 26–9–83, "I am quite recovered, that is, my wound as such is entirely healed, but I am emaciated and worn down, and am not likely to get better. ... I had been banished from camp to avoid the Brevets"[5].

The dett. was re-assembled under Pearse's comd. at the end of the war [41]. "The army was at this time many months pay in arrears, and there was much discontent, and in one or two instances the conduct of the troops was highly insubordinate. By combining that necessary decision of character, which will ever uphold subordination and discipline, and at the same time command respect, with an amiable and ever zealous interest in the welfare of all ranks under his command, Col. Pearse had acquired an ascendancy over the minds of his native soldiery, which proved of the utmost value at this time. ... The conduct of the Bengal Detachment, at the period of their final departure from Madras called forth the highest praise from Lord Macartney and the Government of the Madras Presidency for their past services and their conduct both in field and in Cantonments".

The troops refused to be sent back to Bengal by sea, as against their religious prejudices [40, 343][6], and the dett. started its return march 22–4–84, and after a halt of about 3 months for the monsoon, arrd. at Gaurhāti, opposite Barrackpore, 15–1–85.

Throughout this march a continuous survey of the route was kept up by Colebrooke, whom Pearse appd. Survyr. to the dett.[7] and instructed in the taking of astr. obsns., a number of which Pearse made himself at the more important stations [200, 326–7].

Warren Hastings honoured them with an inspection a few weeks before his departure from India, and amongst the rewards issued, Pearse himself received a "Sword of Honour".

A few weeks later the C-in-C. held a review at Dum-Dum; "When Col. Pearse's detachment of Artillery returned...in 1785, they were quartered at Dum-Dum...and were there reviewed in February 1786, by the Commander-in-Chief, on which occasion Col. Pearse gave an elegant entertainment, at which were present, besides the Commander-in-Chief and the Governor General, a very numerous and respectable Company"[8].

1787, supported plans for Burrow's astr. survey [157]. His correspondence is full of references to other scientific interests.

He describes the Benares observatory [150, 157] and in a letter of Jan. 1774 writes, "When I left Calcutta, our army was encamped at Ramgaut, which is about fifty miles from Delhi on the eastern side of

[1] *Mil. Repository.* I (164); *Calcutta O & N.* (879); cf. Francis. I (309). [2] *Mil. Repository.* I (179–248); *Ben P & P.* III (76 *at seq.*) [3] 16 rupees each. [4] B to C D. 3–2–83 (16). [5] *Mil. Repository.* IV (251). [6] *Ben P. & P.* VI (266). [7] Pearse had great difficulty in persuading Govt. to pass the allowances of dett. staff. (*Ben P. & P.* VI (282). [8] Buckle (236).

the Ganges, and about 150 from the Cataract called the Cow's mouth. It is the source of the Ganges, for there the stream first takes this name, and there is the sanctum sanctorum of the Hindoos"[1].

In a letter to Sir Robert Barker he writes; "Maskelyne [155 n. 13] has suppressed all my astronomical observations, and had not the civility even to answer my letters to him, which is rude enough for a philosopher and a man of science".

In another letter to Sir Robert, dated 13–2–88, after writing "I have not the honour to be a member of the Royal Society"[2], he discusses designs for steam engines, and testifies to the excellent workmanship of Jesse Ramsden's instruments [206].

During the later years of his life Pearse lived in a house in Chowringhee, and owned 4 other houses, including one at "Mootchee Collah", 5 miles from Calcutta. He died in 1789 "a few miles up the Hooghly where he went for change of air"[3] "after a journey to the Sand heads for benefit of his health, and returned with little benefit, ... after a long and painful illness which he supported with the greatest firmness and resolution"[4].

A pillar erected to Pearse's memory still stands at Dum-Dum.

The following extracts from his will tell something of his private life;

"Married to Punna Purree, a native of Hindostan; marriage though kept secret for many years, was in every respect lawful"[5]. —Other native women who bore him children in his Zenana. —To son by his wife Punna Purree Pearse, named Thomas Deane Mahomet Pearse, property in Chowringhee.

Bought the piece of ground in Chowringhee in 1782. — "Warren Hastings at his departure presented me with a diamond set in gold, which I have lodge in the hands of my wife".—

"To Isaac Humphry[6] Lieut., my war horse called Imaum Buksh, which I had with me on the Coast of Coromandel, together with the Saddles, bridles, Trappings, and accoutrements belonging to him; and I also bequeath to the said Isaac Humphry all my mathematical or Chymical Books, together with all my mathematical Instruments of every denomination"[7].

There are still preserved letters from "Panna Pearse" to Warren Hastings, beautifully written in Persian, with interlinear English translation, asking for his protection for "Mr. Tommy"[8]. The young Thomas Deane entered Harrow, Jan. 1787, at the age of 10, and left 1793; he entered Oriel Coll. Oxford 9–6–95, but nothing further is known of him.

PERRON, du.; see ANQUETIL-DUPERRON

PERRY, George. Ben. Engrs.

d. 12–3–86, at Hooghly, Bengal.

Ens. 15–5–83.

m., before 1783, Maria —.

Already in India when recommended by C-in-C. for comn.

Employed on survey of the SE. parts of present Central Provinces towards Ganjam, but withdrawn during the retrenchments of 1785 [38].

PITTMAN[9], Philip. Mad. Engrs.

b. 1740. d. 20–1–75, Vizagapatam.

Capt. 15–9–70.

m., Madras, 1772, Miss Honora Dawkes who after his death m. Mr. Taswell; left a son, Gibbon Charles George Pittman b. Nov. 1773, afterwards Lieut., Mad. Engrs.

Ens. in HM.'s 48th Foot in N. America; 15th Foot, 14–9–60; Lieut. 28–7–62.

13–12–69, Wrote to Directors EIC. refusing appt. of Capt. of Inf. lately granted; was accordingly appd. to Engrs. and duly sworn, 14–2–70 [272][10].

8–12–70, Wrote from Anjengo submitting "a Plain Chart of the Islands in Lats. 4° 30′ and 4° 50" South and in the 53° 3′ E. Long. from the meridian of Paris [Amirante Is]. The French have taken possession of these Islands...I was informed at the Cape of Good Hope. I obtained a copy with difficulty from Mynheer Berga, Member of Council"[11].

Claimed seniority above Montresor, as "My Lieutenancy was dated the 28th July 1762". The Council replied that comn. dated from receipt of the Courts orders, viz. 15–9–70, and refused to supercede Montresor [358][12].

17–1–72, Ordered to make a survey of Fort St. George and Blacktown [94].

April 1772, Engr. to Genl. Smith's force operating in Tinnivelly and Rāmnād, and survd. routes and several forts [90][13].

1773, Ordered to survey of N. Circārs, and employed there till death [3, 92–3, 169, 203, 279].

1795, his son Gibbon was stationed in Vizagapatam, where he was "frequently employed in Surveys... making these in the new conquered situations near his station"[14].

There is an undated map preserved in Calcutta entitled "Sketch of the Island of Salsette", by C.H.S. Pittman, of whom nothing is known[15]; though he may have been another son.

PLAISTED, Bartholemew. Mar. Survr. Bengal.

d. 27–10–67, in Bengal.

Died unm.; Had a cousin Thomas Burnet, of the Strand, London.

Ben. P&P. I (98, 102); VI (107); Sandes, I (47–8).

Arrd. India as Capt. of ship *Kent*.

1745, on death of Aloffe, Appd. Survr. & Engr. on fortifications of old Ft. William, making several plans of the works [51].

1749, involved in disputes with the Council; obtained leave to England; sailing from Calcutta 28–11–49, touched at Cochin and Bandar Abbas, and then had adventurous journey across desert, leaving Basra 15–6–50, and reaching Aleppo 23–7–50.

He walked every day till 9 o'clock, then riding a camel, across which were slung a pair of "*Cajavas*", in which he and his servant, an English sailor, balanced each other. "I am the first who crossed it with a Camel Caravan, and probably have been the greatest Sufferer on that Account; and perhaps am the only Person who was at the Trouble of writting each Day's Occurrences, after having been cooped up in a *Cajava* for thirteen Hours together".

Leaving Aleppo July 30th, he visited Cyprus and Rhodes, and was kept 20 days in quarantine in the *lazaretto* at Marseilles, where he arrived 9–10–50; visiting Versailles on his way across France, he reached London 24–11–50[16].

[1] *Mil Repository*. I (25). [2] ib. IV (334–5). [3] Busteed (117). [4] *CG*. 18–6–89. [5] Probably by muhammadan law. [6] Sec. to Bd. of Ordnance (Hodson). [7] Ben. Wills. 1787–90 (26) with cod. 25–5–89. [8] Grier (434). [9] Sometimes PITMAN. [10] CM. 29–12–69 & 17–1–70. [11] HMS. 105 (383). [12] MMC. 4–3–71. [13] Orme MSS. 333 (32, 34). [14] Mack MSS. LXIX. 28–8–95; *v.* Maltby (163). [15] MRIO. 124 (25). [16] Plaisted (30, 91, 113) etc.

Wrote a long letter 6–8–50, describing journey to Governor Drake in Calcutta[1], and pub. account entitled *Journal from Calcutta in Bengal by Sea to Busserah,* ...to the 2nd edn. of which was added *Account of the Countries, Cities, and Towns adjacent to Bengal,* "with a Map by Mr. Plaisted"[2].

Though this map bears a note that it is "collected from the best authorities", it is said to be little superior to that of van den Broeck dated 1660 [221][3].

Returned to Bengal with order from the Directors for re-employment and, on death of Robins [311 n. 1], held charge of the fortification works till arrival of Col. Scott [51] in 1753. In Court letter of 23–1–54 it was ordered that he should be appd. Master Attendant, or Harbour Master.

1755, placed under suspension and again returned home, thus being fortunate to escape the tragedy of the "Black Hole" [337].

The Directors then refused to allow Plaisted to return to Bengal "on account of a turbulent temper and unbecoming behaviour, lessening the Government in the eyes of the whole settlement"[4], but after two years he was once more sent out, with the appt. of Survr. of Works[5], and sent to Chittagong when that Province was ceded to the Company at the end of 1760 [14]. "Mr. Bartholomew Plaisted was, in compliance to your commands, ordered to hold himself ready to proceed to Bombay, and accordingly gave up the office of Surveyor, ...but being afterwards advised that Mr. Plaisted's assistance would be very useful in compleating the Surveys of the River and Coasts near Chittagong, we have employed him on that service[6] [269].

1760, Employed on surveys of Channel Creek and waterways to east of the Hooghly, and then survd. coasts and creeks from S. of Chittagong to Balasore [2, 151, 152, 184, 283]. He made Chittagong his headquarters most of the time and was given a seat on the Council there, the Directors approving that he "should be given all reasonable encouragement his services deserve, advantages in trade etc. [275], but he is not to rise on the list of Covenanted Servants"[7].

In addition to his surveys he drew up *Navigation Instructions for the coast of Chittagong,*[9] and obsd. the transit of Venus during 1761 [153]. 1763, with Verlest's expn. to Cāchār; survd. route through Tripura and return by water to Dacca [82]. Feb. 1765, was survg. the Meghna near Lakshmīpur where Rennell just missed him[9].

1765, called to Calcutta to join De Gloss in survey of Burdwān [22]. His last job was a visit in 1767 to "the Factory House at Luckypore...to survey its situations, and find a proper spot for new Buildings"[10]. On return from this trip "departed this life after a fever of ten days, the 27th October".

The following extract from his will show that standards of life have changed somewhat since his days;

"I ... give to all my slaves their liberty and freedom, together with all their Cloaths, joys,[11] or anything else I may have given them, and to Martha, at present my slave, I give further the sum of 2,000 Rs., also to Catharine, at present my slave, 1,000 Arcot Rupees; also to Thresia and Anna, formerly my slaves, I give to each 1,000 Rupees[12].

Secondly, as I was never married, I am under the necessity to adopt heirs; my natural and reputed children, Mary & Ann, now in England, under the Care of my esteemed cousin, Mr. Thomas Burnet of the Strand, London; and Samuel, now living with me in Calcutta".

He left further bequests to cousin Thomas Burnet(t); and to his married sisters; also "if any of my slaves be with child when I die", due provision is made[13].

Wilford records a story that "Plaisted, while surveying some parts of the *Sunderbunds,* was carried away by an alligator, which he mistook for the rotten trunk of a tree"[14].

POLIER, Anthony (Antoine Louis Henri).

Ben. Engrs. & Inf.

b. 1740–1, bapt. 28–2–41, at Lausanne, Switzerland. Assassinated, 9–2–95, Rosetti, near Avignon.

Ens. (Inf.) 1–5–59; Capt. Lieut. (Engrs.) 11–10–62 ... Lt.-Col. 12–4–82; Ret. 1789.

Younger son of Jaques-Henri-Etienne Polier, of a French Protestant family which had emigrated to Switzerland in the 17th century, and Jeanne-Francoise Moreau de Brosses, his wife.

Nephew of Paul-Phillippe Polier, Major on Mad. Est., killed, Calcutta, 1758–9.

m. in France, 20–1–91, Anne-Rose-Louise Berthoudt, dau. of Jacob, Baron van Berchem.

Father of Pierre-Amédée-Charles-Guillaume-Adolphe, Comte de Polier.

Ed. at Neufchatel.

Short auto-bio. in preface of *Mythologies des Hindous,* pub. Paris, 1809, prepared from his papers by the Comtesse Polier, his cousin, a translation of which appears in *Govt. Gaz.,* Calcutta, 15 & 22–1–1818,[15] quoted freely below.

DIB.; Dict. bio. des Genevois et des Vaudois; Official Statement of Services, HMS. 90 (91–3), 21–10–85.

1757, Appd. cadet for Ft. St. George, hoping to join his uncle. "I was born at Lausanne...where my family had became naturalised. My Uncle was in the English service. ... I had made some progress in my mathematical studies. ... An opportunity of going to England...occurring in 1756, I went thither in that year, & embarking for India in the year ensuing I arrived there at the age of 18, in June 1758. Deprived, by the death of my relation, of the only friend I had in India, I entered the English service as a cadet, and after being engaged in some actions with the French on the Coast of Orissa, proceeded to Bengal".

1759, Served under Forde during the campaign in N. Circārs, and survd. route of return march to Bengal; apparently on Ben. Est. by this time [28, 91, 345 n. 3].

1760, with Caillaud's force to Patna and, "after that, I was employed as Engineer with the army that was sent against the Nawab, ...and upon the termination of the campaign was employed to superintend the military labours carried on by the troops".

"I was shortly afterwards nominated Assistant Engineer at Calcutta, and in September 1762, succeeded to the post of Chief Engineer with the rank

[1] Orme MSS. VIII (2095). [2] Ben P & P. IV (600). [3] La Touche (38). [4] Carey. I (33). [5] C D to B. 3–3–58. [6] B to C D. 16–1–61 (167–8). [7] C D to B. 19–2–66 (47). [8] pub. by Dalrymple. [9] La Touche (38–9). [10] B P C. 9–7–67. [11] From the Portuguese world *joia,* meaning Jewels, Wright (20 n). [12] On his journey to Europe, 1750, he foreswore all feminine joys. [13] Ben. Wills, 154-63 (61): the conscientious fulfilment of such obligations is a feature of 18th century wills. [14] *As R.* XIV, 1822 (446 n.). [15] Reprinted *As. J.* VII, 1819.

of Captain"[1], the Council resolving that, "Lt. Anthony Polier having served as Sub-Engineer under Mr. Amphlett [309] these two last seasons with great Diligence and Assiduty, and having always from his Capacity acquitted himself to the Satisfaction of his Superiors, He is now esteemed the most proper Person upon the Spot to take charge of the Works [the new Ft. Wm.]. ...

"We have further granted you a commission as Engineer, with the rank of a Capt. Lieutenant in the Army, to enable you to maintain the proper sway and Authority over those who are to, or may in future, act under your directions"[2].

It was about this time that Polier made the map of Midnapore and Burdwān, from which Rennell borrowed the detail of certain rivers; a map probably compiled largely from the work of other surveyors [21, 222, 269].

Sept. 1764, Handed over to Capt. Fleming Martin[3], who had been sent out from England to become CE., and "now proceeded to the Army with the command of a campany of Pioneers"[4]; probably present at battle of Buxar; 21–11–64, Appd. Fd. Engr. to the Army in the Field, and with Munro to Chunar[5].

Continuing his own account, 1764–6; I was directed to join the Army about to proceed against the Mahrattas & Sujah-ud-dowlah, with the title & rank of Engineer which I was allowed to retain. ... After the campaign was finished, I joined the expedition under Lord Clive, and with the rank of Major commanded the Sipahis of his second Brigade. I was so fortunate as to attain the friendship & confidence of that distinguished Commander, and was entrusted with a general superintendence and control over the officers of his army [whose] cabals I was principally instrumental in defeating"[6].

The expn. here referred to was evidently that made by Clive soon after his return to Bengal, 3–5–65, when he went up country to settle terms of peace with the Wazīr of Oudh and the exiled Emperor of Delhi [24].

May 1766, Polier was one of the officers "whose attachment to the service, as well as steady adherence to discipline might securely be relied on", whom Clive took up country to suppress the "Batta Mutiny", and was specially selected to go on ahead to collect early news of the situation at Monghyr[7]. In July he sat as member of ctml. at Bankipore [353].

June 1767, he is shown as doing duty with the 2nd. Bri. as Sepoy Major[8].

It is not clear what appts. he held between 1767 and 1773. In 1765 the Directors had written out that he might succeed Fleming Martin as CE.[9], but he never did so, and Martin held that office till Archibald Campbell arrd. from home in 1769.

Feb. 1768, Polier was in Calcutta "Commanding the Garrison", and making various reports about "works" on the Fort[10].

Both Rennell and Orme refer to a map of Allahābād, Oudh, and Bihar, compiled by Polier in 1768 [222, 226 n. 7].

March 1768, the Directors repeated their order restricting foreigners to the rank of major [333], mentioning Polier by name; the Council protested that Polier's excellent service seemed to mark him for exception,[11] but the Directors did not deign to reply.

1773, Appd. to the service of the Wazīr of Oudh, who had asked for an engineer and architect for "compleating the Works of his new Town of Fyzabad". This provided, the GG. noted, "a creditable Employ for an Officer of long Services and distinguished merit and abilities, who was precluded by the standing orders of the Company from rising in the Service, being a Foreigner, and of course could not perform actual service in the Army without being subject to the command of many officers who were his juniors"[12].

Polier accordingly left Calcutta for Fyzābād, where he "adopted the habits & customs of the natives of the country"[13].

Here he was given charge of the surveyors working in Oudh [2, 34, 226, 354]; "The service which was officially committed to his charge, of Superintending the Surveys in that Quarter, was given in consequence of the great distance of the Surveyors from the Surveyor General, whose residence for some time has been at Dacca, in the opposite extremity of Bengal [235], and for which duty Major Polier was amply qualified both by his Education and considerable Practice. In that part of his duty he receives his instructions from the Surveyor General and transmits his information to him"[14].

Col. Champion, who comdd. the Company's forces in the Rohilla campaign of 1774 [224], complained of Polier's disrespect; "nor has Major Polier, who is also in the Nabob's Court, thought proper, tho' an officer in the Army, to show me any part of that respect which it was his duty to have manifested". — "You must be surprized at the Vizier's conduct. Major Polier's was also extraordinary; he neither offered his services to me, nor asked permission to assist the Nabob's Troops in the action, but remained on his Elephant seven miles in the rear, and, tho' he was in the lines next day, he did not think proper to pay me the usual congratulatory compliments. ...

"But what I understand gives the greatest, and indeed a general disgust, is that Major Polier, whose behaviour has impressed this division of the Army with a most unfavourable opinion of him, should be permitted to reside at the Nabob's Court and visit him at pleasure, whilst at the same time Officers of distinguished merit are altogether denied admittance to his presence"[15].

The GG., Warren Hastings, replied, May 15th, "I have written to Major Polier to proceed immediately to Fizabad, or if the Vizier should not have any further occasion for his services, to return to the Presidency. ... I am much concerned at this behaviour in an officer, whom I have ever hitherto known to have been observant of the common civilities of life, and equally the duties of his profession. ... I have hitherto entertained an esteem for Maj. Polier as an officer and a Gentleman". The following month Champion writes that "Polier went off yesterday morning without doing me the favour of a visit"[16].

Later in the year Polier "was called upon to accompany Sujah-ud-Dowlah in a campaign, and joined at the Siege of Agra under Najef Khan, & contributed essentially to the reduction of the place".

This adventure awoke the strong opposition of Philip Francis and his fellow Councillors, who were only too glad to find an opportunity for interfering with a protegé of the GG., and in spite of every argument that Hastings could bring forward, they insisted that Polier had no right what-

[1] *Govt. Gaz.* 15–1–1818. [2] BPC. 11–10–62. [3] Capt. Ben. Engrs. & CE. under CM. 12–10–63; Resd. 1768 to become Comdt. of Art. BMC. 1–9–68; again resd. Oct. 1769. [4] B to CD. 26–11–64 (36). [5] Caraccioli II (63). [6] *Govt. Gaz.* 15–1–1818. [7] Strachey (163-7). [8] HMS. 198; BSC. 14–1–67. [9] CD. to B. 24–12–65 (25); Polier himself says that he was appd. CE. & Comdt. of Ft. William. [10] BSC. 16–2–68; BPC. 20–7–68 (2a). [11] B to CD. 13–9–68 (138-9). [12] HMS. 90 (91-3). [13] *Govt. Gaz.* 15–1–1818. [14] Minute by GG.; BSC. 19–12–74. [15] HMS. 221 (41), 3–4–74, 20–4–74. [16] ib. 10–6–74.

ever, whilst still in the Company's service, to join the military adventures of the Wazīr. The GG. was over-ruled and Polier recalled to Calcutta[1]. He writes, "Finding that the services of ten years were requited with injustice and suspicion, I determined to quit the Company's employ altogether, and resigned it in November 1775".

He returned to Fyzābād without permission, but Sujah-ud-Dowlah had died and the new Wazīr was called on by the Council to expel him; so he went to Delhi and took service with the Emperor, and was granted the command of 1,000 men, and two *jāgīrs*, one of them "the purganna of Kair in the Sircar of Agra"[2]. He quarrelled with the people of his *jāgīrs* and had to give them up.

May 1780, under the influence of Eyre Coote, he was permitted to return to Oudh and restored to his former post as Engineer and Architect, but the appt. was annulled, March 1782. He was re-admitted to the Company's service with the rank of Bt. Lt. Colonel, but not to serve in any corps, and received permission to settle at Lucknow[3].

Whilst at Lucknow he undertook to build the monument to Cleveland at Bhagalpur[4]; and the artist Wm. Hodges spent about 10 days with him in 1783[5] [354].

Oct. 1785, his offer to superintend a survey of the Upper Provinces was refused[6]. He wrote several historical memoirs, including a *History of the Sikhs*; collected MSS., and was the first European to obtain a complete copy of the *Vedas*, which is now in the British Museum.

In his *Memoir* of 1793 Rennell acknowledges a map of the Punjab by some unnamed European, sent to him by Polier [233].

1779, Put in a claim for "Rs. 2,76,935, the Balance of an account arising from sundry transactions between him and the Nabob; ... large commissions for Army Clothing, stores, ... executed for HE.; ... Arrears of pay and allowances; ... sums lent by him to H.E.". The Resident remarked that "There is a dispute between the Nabob and Major Polier regarding some articles of this account, but as the Major has produced Receipts & vouchers for most of the charges...I see no reason to doubt the authenticity of the account. ... He thinks himself entitled to the legal Interest of 12% which as some of the transactions are of 3 to 5 years standing must greatly swell the balance"[7].

July 1786, wrote to Hastings that he had "now received payment of the greater part of his debt from the Wizier, and am making preparations for return to Europe"[8]. He was allowed to proceed to Europe on half pay before the end of the year, arriving England July 1788.

5-1-88, Sir Wm. Jones gave him a letter of introduction to Dr. Ford, Principal of Magdelen Hall, Oxford; "Give me leave to recommand to your kind attention Colonel Polier, who will deliver this to you at Oxford. He presents to the university an extremely rare work in Sanscrit, a copy of the four *vedas*, or Indian scriptures, which confirm, instead of opposing, the Mosaic account of the creation, and of the deluge. He is himself one of the best disposed and best informed men who ever left India", and on 11-10-90, Jones wrote again thanking Dr. Ford "for your kind attentions to Colonel Polier"[9].

Polier settled in Lausanne for a few years and moved to Rosetti in France 1792, from which year also he drew a pension from Lord Clive's Fund. In 1795 his house and possessions were plundered by robbers of the Revolution, and he was murdered in their defence.

His portrait appears in Zoffany's picture *Col. Mordaunt's Cock Fight*.

PORTSMOUTH, William. Ben. Engrs. d. April 1769.

Ens. 1-11-67.

Left his estate to his mother and three sisters, and mentioned two bros.-in-law, John & James Pitt of London, presumably bros. to his "beloved wife".

In will sd. Dacca 17-7-67, John Adams [308] mentions Portsmouth as "lately my assistant in surveying", at which time Portsmouth must have been a cadet waiting for admission[10] [266].

Dec. 1767, Send on survey to Midnapore with an escort of a company of Sepoys, and survd. roads in "Bissenpour", the Dummoodah and Dalkisor" rivers, and part of "Pachete", all in the Manbhum and Midnapore Districts[11] [33, 225].

When writing his will, Aug. 1768, he was "sick and weak in body", and, 10-5-69, Wm. Thackeray[12] wrote from Calcutta to the Resdt. at Midnapore.

"I am directed by Mr. Cartier[13] to inform you that he has received your favour of 3rd inst., and is extremely sorry to hear of the death of Mr. Portsmouth. He requests you will forward to him all such papers and drafts as you may find relative to his surveys"[14].

In his will Portsmouth left "to Mr. John Blair of Calcutta, my Slave Boy, and choice of either of my horses"[15].

PRINGLE, Andrew. Ben. Inf. d. 1803.

Ens. 22-11-71 ... Capt. 26-2-81; Resd. 17-12-92.

Bro. to Col. Robert Pringle.

m., Lucknow, 5-6-90, Cordelia, dau. of Lt Col. John Fortnom, Ben. Engrs. [334], by whom he had two sons and two daus.

18-10-74, with corps of Lt. Inf. stationed in Jungleterry, survd. country between Rājmahāl Hills and Madhupur, the present Santāl Parganas [35].

Whilst at Deoghar, became involved in disputes with the local revenue farmer, and was led by zeal to take somewhat high-handed action, which met with severe disapproval from the Supreme Council, and led to his removal from Jungleterry [295].

Two years later, when Rennell asked for his services again, Gen. Clavering, C-in-C., objected; "Whilst he was acting in this Quality, a complaint was made to me, that he had seized and confiscated the effects of —. I wrote to Captain Brown in whose Battalion Ensign Pringle was, & find that he had taken the managment of the Revenue Collecting into his own hands ... for the sake of the inhabitants, as a punishment for the repeated acts of oppression and injustice that he had heard had been committed. ... The Board, not being willing to ruin the young man by bringing him to a courtmartial, ... ordered

[1] BS & F. 24-2-75 (11). [2] BM. Addl. MSS. 29138 (34-47); letter to Warren Hastings. [3] ib. 29145 (160); letter thanking Warren Hastings. [4] Grier (309). [5] Hodges (145). [6] HMS. 90 (91-3). [7] BPC. 23-8-79; cf. Marsac [352] [8] BM Addl MSS. 29170 (129). [9] Teignmouth. II (133, 201). [10] *Midnapore Dist. R.* I. (275). [11] IO Maps. I. A C. 13. [12] Brother-in-law to James Rennell [qv]. [13] Governor of Bengal, 1769-72. [14] *Midnapore Dist. R.* I. (455) 10-5-69. [15] Ben. Wills. 154-63 (54).

him to rejoin his regiment, and not to be permitted to return to surveying business"[1].

However Warren Hastings did not think this should bar his re-employment; "I have a good opinion of Mr. Pringle's abilities as a surveyor, and consent to his being employed in that Character on any service, provided it be not in the Jungleterry District".

Pringle was accordingly sent to complete the survey of Cooch Behār, a matter of about three months work, and then returned to his unit at Midnapore, April 1777 [36, 183 n. 1].

During 1778, on survey of Subarnarekha R., and 1779, in Shahābād [37]. 1783, Sent the SG. "a plan of Rhotas and its dependencies"[2], writing, "I should deem myself highly honoured in receiving your instructions to make a survey of the Purgunnah of Rotas, in order to ascertain its true extent and value", ...but retrenchment was now the order of the day, and no more surveys could be sanctioned [38][3].

1792, Resd. and settled at Lucknow to engage in commerce; in 1794 he was arranging terms for supplying the Company with 1,000 tons of sugar, and in a cod. to his will sd. Lucknow July 1801 he says that he was "deeply engaged in commercial pursuits"[4].

Shortly after this he went home with a letter to the Directors from the GG.; "Introduces Mr. Andrew Pringle, a most respectable merchant who has long resided at Lucknow, and whose general conduct has met my particular approbation. He has recently been employed in the management of an important branch of the Company's Investment in Oude"[5].

PRINGLE, John. Mad. Inf.
d. 27–5–88, Cuddalore.

Ens. 7–12–70 ... Capt. 2–11–83.

Nephew to John Shield of Islington, London, and bro. to Mary, wife of William Shawe, of Dalkeith, Edinburgh.

d. unm., leaving a natural dau., b. *c.* Oct. 1784.

Arrd. Madras 14–8–70.

1775, the C-in-C. reported that Pringle had devised an improvement "in the fixing of the Ramrod to the Carbine", and "has been at great expence and trouble in completing this, and attending to its tryal at Cuddalore"[6]. In acknowledging this "very material Improvement", the Directors sent out "to Lieut. Pringle, a neat Fuzee with his own Improvement, as a complimentary Acknowledgement of his Merit"[7].

Aug. 1775, with 1st Batt., 1st Bri., at Pālamcottah; June 1776 with 16th Batt.

1777, Submitted two books of survd. roads, and survey of the Tanjore anicut; Appd. Capt. in Corps of Guides from Aug. 1777 [4, 95, 272].

28–8–77, with Cosby's force which assembled at Sholinghur[8], and after a short campaign defeated the troops of *Baum Rauze*. 1778, Wounded at the siege of Pondicherry.

Jan. 1779, Attd. to Brathwaite's force which marched from Trichinopoly through Madura, and across the Ghāts to Anjengo, where it was to embark for the capture of the French settlement of Mahè. In his capacity as Capt. of Guides, Pringle was sent in advance on general intelligence duty. Brathwaite reported, 4–2–79; "I have received a letter from Capt. Pringle, wherein he informs me that the King of Travancore, tho' he treated him with great civility, would by no means allow him a passage by the direct and good road through his country, and under the pretence of an escort, carried him as a prisoner under the care of a Subadar and 20 Seapoys, the Subadar told him he was not allowed to strike into the Country 200 yards from the sea Beach, nor must he hold conference with anyone, not even the *Portuguese Missionaries*. ... Captain Pringle was to embark on board...for Tellicherry, from whence I shall soon hear from him again"[9] [96].

March 1780, put forward a scheme for establishing the Corps of Guides on a permanent footing for the collection of surveys and military information; at the same time submitted his 3rd. Book of Roads, and asked for brevet rank as Captain and an increase of allowances, both of which were sanctioned [279–80].

July 1780, Surveying near Ongole[10] when Haidar Ali invaded the Carnatic, and reported, 27–7–80, that he found "the villages deserted on account of Plundering Horsemen".

The following week he wrote to the Select Committee, "Lt Col. Baillie has just communicated...orders for me to join the Army; ...shall...lose no time in getting to the Southward, leaving my company of Guides under Col. Baillie's command. Thinking that you would forgive me for quitting the inglorious employment of a Surveyor, to render what service I could in a more Military line, I have accompanied Col. Baillie thus far on his expedition, and intended to have remained under his command until I knew your pleasure respecting my situation"[11]. He pushed on, and joined Hector Munro's staff at Conjeevaram, whilst Baillie marched steadily on to disaster [96].

From now till the end of the war in 1784 Pringle was engaged on survg. the routes of the armies marching to and from through the Carnatic, and on general "intelligence" work. He was present at the capture of Karunguli, and mentioned in Coote's despatches of 21–1–81. After the war he submitted to Government a complete *Book of the Roads of the Carnatic* several copies of which are still preserved; the Book was accompanied by a plan [97, 169, 184, 199, 287].

At the India office is preserved a most interesting letter from Pringle to Sir Hector Munro, who had incurred great public criticism for not taking vigorous action to prevent the disaster to Baillie's force at Perambākkam[12] on 10–9–80; Pringle writes from "Bowanygunj, near Chillumbum"[13], 16–9–85, replying to 5 different letters from Munro; after explaining that he had not written before because he had asked others to send home their opinion that Baillie had brought his disaster upon himself,—he continues, "I am at present employed in examining all the Routs by which the Army may have occasion to march, and cannot without running risk, nay without a *certainty*, of losing the most beneficial appointment I have ever had in my life, proceed to Madras, at a time when, from the sickness of the

[1] I O Copies, 1777 (43–4). [2] M R I O. 56 (7). [3] B P C. 13–11–83. [4] Ben. Wills, 1804. [5] B M Addl MSS. 13715 (15). [6] M M C. 25–4–75. [7] C D to M. 3–2–80 (12). [8] 57 O/8. [9] M Sel C. 7–2–79. [10] 66 A/2. [11] M M C. Aug. 1780. [12] 57 P/9. [13] Chidambaram, 58 M/11. For vindication of Munro *v.* Cox & Stuart (288).

Treasury, Government is obliged to suspend the most necessary services. ... I instantly sent to Madras for every paper... I had, recollecting that amongst the rest there was the triplicate of a Letter, written by me, and signed by you, positively ordering Colonel Baillie to march on in the night, ... which letter I despatched from the Camp at Conjeveram. ...

"My heart bleeds when I reflect on the unkind return you have met with for all the eminent Services you have performed. ... It shall be my endeavour, I assure you, to set this matter in its true light to all the world. For the present on my own affairs, I will only give you my sincerest thanks for advancing the 200 pounds on account of my infirm sister, whose soul is now with GOD who gave it"[1].

The "beneficial appointment" above referred to was the result of a proposal which Pringle had put forward that he should be put on special duty to extend his surveys to all the roads of the Carnatic and make a complete survey of the country [97, 170, 257], on sanctioning which the Council consented "to Capt. Pringle drawing Major's pay during the periods of his absence upon service, in addition to the other allowances enjoyed by him in the field".

In 1786 fresh orders were issued for the est. of the Corps of Guides, and Pringle was appd. Major of Guides [6, 109, 287].

Two years later he died near Cuddalore, reputedly "through taking by mistake some violent medicine instead of common salts". He was buried at Christ Church, Old Town, Cuddalore, where an inscription to his memory existed[2].

RANKEN[3], Charles. Ben. Inf.
b. 1751–2. d. 9–4–1802.

Ens. 1769 ... Capt. 15–11–80; Furl. 2–11–85.

Eldest son of Rev. John Rankin, Presbyterian minister at Antrim, and Sarah his wife; bro. of John & Willam Rankin, both of Ben. Inf.

m., 18–1–87, Mary, dau. of Rev. Moses Grant, rector of Nolton, co. Pembroke; father of John Grant Ranken, Ben. Inf.; M I. St. Mary's churchyard, Hornsey.

Hodson.

Sept. 1776, ordered on survey of Rāmgarh, with Dodsworth as asst. [334], but survey was suspended 4 months later owing to disturbed state of country [36, 270]. Resuming work some time later, Ranken writes, "In the month of July 1781, when on a Survey of the Mahratta Frontier, your memorialist received an order from the Governor General to attend him immediately in Calcutta.

"The Supreme Council then ordered me to undertake and complete a road...from Calcutta, in a straight line through the Hills and Jungles, to Chunar-Gur[4], for the more safe and expeditious conveyance of letters, and the more easy communication and march of the Army through the Provinces, it being nearer than the old road by 140 miles" [38][5].

He was promised 50,000 *Sicca* rupees as personal remuneration, and the Directors were astounded at such extravagance; "This undertaking we find is to cost the Company at least two lakhs and a half rupees.

"When we consider the enormous amount of your Military charges, the Scarcity of cash at our other Presidencies whereby they are unable to pay the Troops (362)..., we are astonished at the measure; nor can we withhold our surprise at...the enormous gratuity, ... which we can by no means assent to; but if upon the completion of the business, the officer shall appear entitled to some Reward, we will...take the same into our consideration. ... However as the business will be in great forwardness by the time of your receipt hereof, we have only to enjoin you never to exceed the sum of Rs. 16,000 per annum for keeping the road in repair; and to direct that all future projects of this kind be submitted to our consideration before you carry them into execution"[6].

The Council replied,

"We have intimated the purport of your orders concerning the reward of Capt. Rankin for this service to him, and as the most difficult part of the Road is completed, we have desired him to finish the remainder of it in the manner he intended, when the restriction which you have been pleased to lay for the expence of its repairs shall be punctually attended to.

"We cannot quit this subject without remarking how hard it is that we should receive your censure for an act for which we did think ourselves entitled to your approbation. ... The distance of Chunar from Calcutta by the present Road is 600 miles, it will be reduced to 398 exactly by that now making. The passes in its course over the most impracticable parts of the Western quarters of Bengal, thro' Woods, Rocks, and Hills, hitherto impassable; the whole expence on the estimate if the Commission be included will be Sicca Rs. 2,88,875"[7].

15–11–84, Ranken submitted "plan and measurements of the public Road lately completed from Fort William to Chunarghur, via Raganathpoor and Sheergotty" [38 n. 10][8], and, when reporting the final completion, the Council wrote; "The Trial of some months has fully evinced its utility; the Dauks pass with greater Rapidity throughout the Provinces, at a reduced rate, and your troops effect their Marches with facility and without any impediment. ...

"We think it but Justice due to Capt. Ranken to recommend his Claim to your favourable consideration, and to express our hopes that it still be admitted.

We have positively directed that the annual expence of repairs shall not exceed...16,000 rupees, or 40 rupees per Mile"[9].

Ranken then applied for permission to "retire for three years, ... my pay continuing in Bengal. The state of my health very much impaired by a late and severe illness, and the situation of my private affairs jointly, compel me to solicit this favour"[10]. This leave was duly sanctioned, and he reported his arrival in England 11–6–86, at the same time praying for payment of the Rs. 50,000 that had been promised; in their despatch to Bengal, 22–12–86, the Directors gave directions for the payment of this sum, and ordered "report on the state and condition of the road to be annually transmitted home, and also account of expences on repairs, which are not to exceed Rs. 16,000 annually"[11].

His brothers John and William continued in succession to maintain the road after his departure on furl., in the capacity of "Superintendent of the Military Road".

Rs. 40 per mile on 442 miles was allowed each year from 1789 for the upkeep, a regular report being required "from the Quartermaster General and from the Collectors of Districts that the road has been kept in a proper state of repair"[12].

In 1791 it was ruled that a further sum of "Sicca Rupees 1,000 per annum is to be allowed to Capt. Rankin, Superintendent of the Military Road, for cutting down the jungle contiguous to the road"[13].

[1] H M S. 223 (93). [2] Cotton. [3] Other members of family spell name Rankin. [4] 63 K/16. [5] Misc L R. 78 (255), 11–6–86. [6] C D to B. 28–8–82 (25). [7] B to C D. 23–10–83 (126). [8] Passing thro' Hazāribāgh; Everest's line of semaphore towers followed generally Ranken's road. Lister (1420). [9] B to C D. 1–8–85. [10] B P C. 2–11–85. [11] C Cor. 5–12–86. [12] Ben to Mil Bd., 10–11–91 & Carroll's Code. [13] B to C D. 31–10–95 (49).

Ranken's house and premises in Chowringhee were sold in 1793[1], and he was struck off the strength the same year.

READ, Alexander. Mad. Inf.
b. *c.* 1751. d. 19–5–1804, Malta.

Ens. 18–5–72 ... Col. 1–5–1804; Furl. 9–4–1800 till death.

Son of Alexander Read of Torbeg, and Elizabeth Wedderburn; his sister Jean was mother of Alexander Beatson [311].

Left one or two sons; uncle to Alexander Read, Mad. Civ. Bradshaw (217–9).

Taken prisoner at Baillie's disaster, 10–9–80 [40]; released at treaty of Mangalore, 11–3–84.

1788, in charge of Intelligence Dept. with force occupying Guntūr, making cursory survey of roads between Penner and Godāvari rivers [110].

1789–90, Comdg. at Āmbūr, in charge of Intelligence Dept.; 1791–2, 3rd Mysore War, in charge of transport of supplies.

1792–9, in civil charge Bāramahāl and Salem dists. as Supt. of Revenue, the first military officer to receive such appt. After making rapid sketch of the country during 1793 [113, 193], employed Mather on geographical survey and, with aid of three military officers and native staff, completed the first *raiatwāri* settlement and survey made by the English in India. His system of a 30 year revenue settlement formed, in its main essentials, the foundation of the Madras and Bombay systems for the next sixty years [7, 144–5].

1799, 4th Mysore War, comdg. a dett., captured hill fort "Shulagherry", 15–3–99.

6–5–99, Resigned his station as Superintendent of Bāramahāl and Salem[2].

REICHEL, Thomas Joseph.
Draughtsman in C E's. office, Madras, 28–10–83; Discharged 1791.

"In 1780 Baron Reichel...offered his services as an Engineer to the Hon'ble the Court of Directors... who, induced by...the length of his services in the Austrian Army, came to a resolution of appointing him a Captain in their Corps of Engineers on the establishment of Madras.

"But, after the annual election of six new Directors in April, ...the Court...thought proper to rescind it [the appt.], on a plea that as a foreigner he was not eligible to so high a rank in their service, but voted him one hundred guineas as a compensation for the expences he had incurred in preparing to go to India.

"Baron Reichel, being at that time married to a Lady who had some property at Madras, which, to realize, required her presence in India, and being unaware that a permission from the Court of Directors was necessary to go to one of their settlements, they proceeded without applying for one via Bagdad, Bussorah, Bombay, and arrived at Madras in June 1783"[3].

M P C. 10–1–84, under resolution of 28–10–83, Appd. "to assist in the Engineer's office with the usual Field allowances formerly granted to Surveyors", and employed on copying plans for the Directors [97, 245].

Amongst the maps he copied was one of Pittman and Johnston's survey of the *Chicacole Circar*, which the Directors considered "unwieldy" though an "elegant map" [93, 252–3].

In 1791 the C E. reported that "Baron Reichel is the only one [surveyor] under my direction out of the corps; he has been hitherto employed in preparing Plans for the Court of Directors, whose approbation you will perceive he has merited" [273][4].

The Baron's narrative continues; "The natural desire which every man has of improving his situation in life induced Baron Reichel to solicit...the Employ long vacant of Civil Architect, ...but Sir Archibald Campbell having declined to favour the application, Baron Reichel, in the year 1790, requested his friends in London to solicit the Court of Directors for the said employ in his behalf. But how different was the result of his flattering expectations, when...an immediate order...came out, "It is our positive order that the Baron Reichel, who we are informed is at your Presidency, be not permitted to reside within the limits of any of our settlements"[5].

The Baron was accordingly discharged from the C E's. office, but after an appeal and a recommendation from Madras, the Directors relented; "As this gentleman proceeded to Madras without our licence, and even after he had recovered a compensation for having been removed from an appointment in the Corps of Engineers, ...he could have no case of complaint if we were to adhere to our former orders; but from the...testimonials you transmit of his faithful and upright demeanour, ...we authorise him to remain...so long as he shall continue...to merit that Indulgence"[6].

After yet another petition for re-instatement, the Directors approved that this may be allowed, but the C E. had by this time filled his place, and his services were offered to Topping who replied, "I have known Baron Reichel these nine years past, and ... he always appeared to me a man of Merit, Talents, and good character, and ... I have no doubt but that he may be very usefully employed in my Department"[7], and that is the last that we hear of the Baron.

RENNELL, James. Ben Engrs.
b. 3–12–42. d. 29–3–1830.

Ens. 9–4–64 ... Maj. 20–1–75; Resd. 9–4–77. S G. Bengal, 1767–77.

Son of John Rennell, Capt. of Art., killed on active service in the Pays Bas, 1748, & Ann Clark, his wife who, on her 2nd marriage, became Mrs. Ann Elliott.

b. at Upcott,[8] near Chudleigh in Devonshire; brought up and ed. by the Rev. Gilbert Burrington[9], Vicar of Chudleigh.

m., Calcutta, 15–10–72, Jane, dau. of the Rev. Thomas Thackeray, Headmaster of Harrow School, and sister to William Makepeace Thackeray, Ben. Civ., grandfather to the novelist; she d. 1810.

1st dau. Jane, b. June 1773, d. Dacca 29–7–74. M I.

2nd. dau., also Jane, b. St. Helena, Oct. or Nov. 1777, m., 5–10–1809, John Tremayne Rodd RN., afterwards Vice Adm., KCB. Her grandson, James Rennell Rodd, was cr. Baron 1933, becoming 1st Lord Rennell[10].

[1] *C G.* 11–4–93. [2] M R C. 6–7–99. [3] M P C. 12–12–94. Petition of Baron Reichel. [4] Mack MSS. lxix. 7–1–91. [5] C D to M. 5–1–91. [6] ib. 9–2–92 (32). [7] M P C. 18–12–94. [8] One of his father's two farms. [9] His guardian. [10] b. 9–11–1858; d. 2–7–1941, succeeded by eldest son, Francis James Rennell Rodd, b. 1895.

Eldest son Thomas, b. Nov. 1779, d. unm. 1846; second son, William, b. Jan. 1781, Ben. Civ. 1–11–98; dsp. 25–7–1819 at Fatehgarh [*inf.*].

F R S. 1781.

D N B.; D I B.; H M S. 765 & 815 (Letters to Burrington and others); *Eur. Mag.* 1802; Century Series; Yule; Hunter (75–81).

Jan. 1756, Joined navy as midshipman shortly before outbreak of the 7 years war between England and France. 1758, on service with naval force off north coast of Brittany; during the action at St. Cast, Sept. 11th, "Young Rennell was...engaged in taking notes and bearings for...a plan of St. Cast Bay, showing the positions and movements of troops and ships, and the surroundings of this disastrous action"[1].

At end of 1759, volunteered for service in East Indies, and joined frigate *America*, Feb. 1760, at Portsmouth; provided himself with a quadrant and drawing instruments [200], and wrote home, 4–3–60, "There is a gentleman sent on board who is a compleat draughtsman, and will teach it to me".

Had a rough passage out, and wrote from Fort St. David, 30–9–60; "Capt. H. (of *America*) has behaved very badly, having used his fists to me and another officer, and a stick to others. This Capt. H. is at best no better than a bully, for he had his nose pulled publickly by a common Negro at Madagascar and took no notice of it".

At Madras he tr. to the *Grafton* to serve under his first captain, Capt. Parker and, 6–10–60, took part in a successful raid by which boats from the English Fleet at Cuddalore cut out a large French frigate and an Indiaman off Pondicherry under very heavy fire; Rennell had volunteered to make the preliminary reconnaissance[2].

During a visit to Trincomalee in Nov. he made a survey of the harbour, "by means of which I flatter myself that I have gone a great length towards gaining both his [Capt. Parker's] and Mr. C's esteem." I made some draughts of Harbours on our Passage out, copies of which I presented to Capt. P.; ... I have since found means to make myself master of surveying, &c, and shall according to your advice practice it whenever I find opportunity, especially as Capt. P. has promised to assist me in anything of that kind"[3].

20–2–61, writes that he has been promoted to be Master's mate, salary £ 35 a year, and is still studying surveying. The *Grafton* was at Bombay Aug. 1761, and in Dec. at island of Diego Rayes, where Rennell surveyed the anchorage[4].

21–3–62, writes that Capt. Parker could promise no promotion, and advised him to enter E I C.'s service; the following month he accepted an offer to accompany expn. to far east led by Dalrymple in one of the Company's ships [330].

Kept a "Journal of a voyage to the Sooloo Islands & the N.W. Coast of Borneo[5]. ...

"Having leave of Capt. Hyde Parker of H M.'s ship *Grafton* to accompany Mr. Dalrymple in a voyage to Sooloo Isds. & China, in the capacity of his Companion & Asst. Drman, or Surveyor, I left the *Grafton* in Madras Roads, the 9th April 1762, & staid ashore at Madras for the recovery of my health till such time as Mr. D. was Ready to embark. ... Half the goods shipped on the *London* to be Commanded by Mr. Dalrymple, remainder to follow. ... Mr. D. had accidently touched at Sooloo in 1761, & promised to trade with the islanders" [330].

10–6–62, Embarked on the *London*, a ship of 150 tons, and sailed the following day; his journal runs to over 100 pages, and tells of surveys in company with Dalrymple, many adventures, and much sickness, small pox, and scurvy.

After passing through the Nicobar Is. on the way back, they took 19 days with light winds to Pulicat[6] "where being quite destitute of Provisions, wood, and water, We ran into Pullicatt Islands and made a signal of distress, we having at this time more than 100 People on Board. ... The same day (March 19th 1763) I left the Ship in Pullicatt, having leave of Mr. Dalrymple to return to Madras. ...

"The Charts, Plans, & views belonging to, and mentioned in this voyage, were all lost in the ship *Union* in Madras Roads in October 1763; this Book being saved by remaining on shore. Copies of most of these plans &c. are in the hands of Alexander Dalrymple Esq. lately gone to Europe[7]. J. Rennell. Ft. St. George", 30–10–63.

All hope of further advancement in the Navy being extinguished by the Peace of Paris, Feb. 1763, Rennell took his discharge in July, and after refusing "command of one of the Company's ship of War"[8] obtained command "of a fine ship of 200 tons, drawing £ 200 a year pay, besides trade". The *Union* was however sunk off Madras during a hurricane which lasted from Oct. 20th to 23rd, and sank all the ships in the Roads[9] except one; "every moveable belonging to me was on board, so that I saved nothing but what remained on my back. I fear the loss of the ship and Cargoe has also ruined my merchant"[10].

"About six weeks after the loss of my large vessel (which happened the 21st October 1763) I was appointed to command a small ship in the service of a very worthy Merchant who was half ruined by the same storm".

Whilst commanding this ship, the snow *Neptune*[11], Rennell survd. the coast from Calimere Point to Tondi (pl. 9), a survey extended by Stevens the following year [87] and used in his *Map of Hindoostan* twenty years later.

"A private friend of mine recommended me to Mr. Palk [87. n. 9] as proper person to superintend the disembarkation of the troops to be employed in that expedition [the Siege of Madura]. ... The last grand detachment being landed, I returned to Ft. St. George the latter end of February [1764] when the Governor and Council were pleased to signify their approbation of my conduct by...a handsome present...

"I left Ft. St. George the beginning of March, and returned to my Owner's Port, from whence I was ordered to make a voyage to Bengall. ... On my arrival in Bengall I met with my worthy friend Capt. Tinker, who commands the King's Squadron here, ...[who] hearing me mentioned in a genteel

[1] Century Series (20–2). [2] Yule. [3] H M S. 765, 31–1–61. [4] Rodriguez, 19° 40′ S.; 63° 25′ E.; B M Addl MSS. 33765 (24). [5] B M Addl MSS. 19299. [6] 66 C/7. [7] By way of Manila [330]; Dalrymple pub. several of Rennell's surveys later. I O. Maps II. A C. 36 (28 *et seq*). [8] H M S. 765, 1–6–63. [9] There was ten no sheltered harbour at Madras [348]. [10] H M S. 765, 7–11–63; Orme MSS. 21 (170). [11] Obviously not the *Neptune* in which Dalrymple sailed for Sulu Is. in July 1763 [330].

manner by Mr. Carnac, the Commander-in-Chief [to whom Rennell had introductions], ... waited on Mr. Vansittart the Governor the same night, & produced me a Commission for Surveyor General of the East India Company's Dominions in Bengall; before I was scarce apprised of the matter, and a few days after, I had another Commission sent me for Practitioner Engineer in the Citadel erecting at Calcutta, near Fort William. ... After having stayed a month at Fort William I was ordered on service"[1].

Rennell was certainly not made Surveyor General at this time, and the only official record of his appt. is the following Resolution of 9–4–64;

"Mr. Hugh Cameron [13, 324–5] who was employed ...as a Surveyor of the New Lands having deceased the 16th ulto.; It is agreed to appoint Mr. James Rennell in his room, who is recommended to us as a capable person, & by specimens of some Surveys made by him, which the President now lays before the Board, promises to be a very useful servant [269].

"Ordered that the Secretary do advise him & the Committee of New Lands of his appointment, acquainting them that he is to receive the same allowances as the late Mr. Cameron" [2, 275,][2].

Rennell did not however carry on Cameron's survey of the 24 Parganas. He sent home later a memento of his month at Ft. William in the form of "a plan of the new Citadel, but it is not quite exact, as indeed it is not my duty to send one that is so"[3].

On May 6th he received orders to make a survey of the Ganges in search for a navigable channel giving communication with Calcutta, and the account of his work already given [17–21, 182] is taken mainly from his Journal, now at the Victoria Memorial in Calcutta.

Leaving Calcutta by boat, 7–5–64 [17, 283], he started work on May 19th at Jalangi on the Ganges and worked down river to Dacca, where he spent a few months of the rains, recovering from bouts of fever. He then carried his survey down the Meghna to Lakshmīpur and the following year up the Brahmaputra as far as Goālpāra on the borders of Assam [151–2, 201].

May 1765, Clive arrived in Bengal for his second tour with his interest in maps already stimulated by correspondence with Orme; his attention being directed to Rennell by Carnac's recommendation, he sent orders in October for him to start a general survey of Bengal [20, 22].

Rennell was joined on Dec. 11th by Richards, of whom he writes, "I have now company at all times; and luckily for me, the gentleman proves a very agreable and cheerful companion" [22, 270, 291, 381].

They left the Brahmaputra and surveyed right across Rangpur and back to the Cooch Behār border, where, in Feb. 1766, they fell in with a company of sepoys commanded by Rennell's sailor friend Dennis Morrison [358], and engaged against a band of *sanyasi* marauders [23, 292, 300]. Joining in the fray, Rennell was badly cut about;

"Morrison escaped unhurt; Richards, my brother officer, received only a slight wound and fought his way off; my Armenian assistant was killed and the sepoy Adjutant much wounded. ... I was put in a palankeen, and Morrison made an attack on the enemy and cut most of them to pieces. I was now in a most shocking condition indeed, being deprived of the use of both my arms; ...a cut of sabre had cut through my right shoulder bone, and laid me open for nearly a foot down my back, cutting thro' and wounding some of my ribs. I had besides a cut on the left elbow which took off the muscular part of the breadth of a hand, a stab in the arm, and a large cut on the head[4]. ...

"I followed the Detachment in my Palankeen, and was embarked on a small boat for Dacca the 23rd. The 26th I arrived at that place and for the first time got Assistance from a Surgeon, having been near 6 days without the least Assistance"[5].

After three months he was out on survey again, but he felt the effects for a long time; and over twelve months later wrote to his guardian, 10–3–67, "I find my constitution terribly hurt by the Accident I mentioned, ...and tho' it neither affects my Appetite or spirits, yet I am not capable of going through the fatigues I formerly was. ... I neither presented a mark to weather or diseases, my spareness of Body effectually preventing it. My Arm is very weak, and during the whole cold Season past I have had little use of it except for writing or drawing, for the shoulder Bone now lies immediately under the thin covering of the scar".

Again, 25–9–67, "I am at present rather better than I have been since I was wounded, for I had an intermitting Fever for near nine months after I got up; t'was to the great surprise of the Doctors that I recovered from the first Disaster; for there was something extraordinary in the length of time that elapsed between the time I got wounded, and my being first drest, for in this Climate the flesh of a European soon mortifies under such circumstances".

Still in a weak state, he had made an easy trip to Chittagong and back during June, but was smitten by malaria, the scourge of that noisome climate; "on my return from Islamabad towards Dacca, I was seized with a fever and ague, and continued very ill till near the middle of July"[6].

Nov. 1766, he was out again with Richards to survey the rivers of Pabna and Rājshāhi, and then hurried down to Calcutta "by reason of the sudden departure of Lord Clive". They reached Calcutta at end of Dec., and spent the next month "compiling and copying maps for Lord Clive", who sailed at the end of Jan. [24].

Before leaving Clive acknowledged Rennell's good work by appointing him Surveyor General, 1–1–67 [31], and Rennell writes, 10–3–67; "In the beginning of the year I had a new Appointment of Surveyor General of the 3 Provinces of Bengall, Bahar, and Orixa, (whereas before I was only Surveyor of the Company's Territories given them by the Nabob) and since I wrote you last I have had two steps in

[1] HMS. 765, 1–9–64. [2] BPC. 9–4–64. [3] HMS. 765 10–12–64. [4] ib. 30–8–66. [5] La Touche (74). [6] ib. (78).

my military capacity. From Lieut. to Capt Lieut. [267] and from that to Captain & Director of Engineers [266]. I have at present 3[1] above me in the Corps of Engineers" [26].

For the next seven years Rennell and his surveyors continued to extend their surveys east and west over the Company's territories and beyond the frontiers where possible. Rennell himself took the countries to the north of the Ganges from Purnea on the west to Sylhet on the east, which he was able to reach by boat from Dacca, where he spent about three months of the rains every year, and where he compiled his maps as the surveys came in to him [2, 32–3 222–7].

He was an intimate friend of both Verelst & Cartier, Chiefs of the factories at Chittagong and Dacca, who followed as Governors after Clive's departure, and Rennell was frequently called down to Calcutta on business connected with his maps.

25–9–67, he writes home from Calcutta, "My Employers...have offered me an easier tho' not so lucrative a post as my present one[2], however I am resolved to persevere. ... I was ordered down from the Western parts of the Kingdom to this place in order to form a map of the Provinces, which is to go home by the first ship. I arrived here in the beginning of August, just after the commencement of the rainy season".

Dec. 1767, after leaving Calcutta, he went north and survd. the borders of Assam near Rangāmāti, working up to the foot of the Bhutān Hills until driven back by the Bhutanese [32, 76, pl. 5], and during the next two years he survd. the eastern districts including Sylhet [82–3].

May 1768, again called down to Calcutta, and whilst there "engaged on the destruction of the fortifications clandestinely erected at Chandernagore". "I have some suspicion of being kept in Calcutta next year, however I shall do my utmost to disengage myself from so disagreable a place"[3].

He did not get away till December, and his fears were justified for he was in Calcutta from May 1769, employed with the CE. on the survey and demolition of "the ditch and Rampart of Chandernagore...which was constructed round the Boundries of that Settlement. ... This Rampart was found to be a definite work of fortification, and not merely an embankment to protect against flooding", as the French had represented it[4]. 1772, when he was in Calcutta for his marriage, he was sent to Chandernagore to report on the damage done by river floods, and reported that it seemed "no more than what is experienced all over the country by the heavy Rains", and could not possibly be due to the demolition of the works the French had been building round their colony[5].

At the end of 1770 he was working westwards through Rājshāhi and had an exciting encounter with a turbulent *zamīndār, Cadder Beg,* who turned out his whole village to stop the survey; Rennell managed to get out of the situation without disaster by shewing patience and firmness, and *Cadder Beg* was duly dealt with by the authorities [292–3].

Two months later he was warned of the approach of large bands of *Sanyāsi fakīrs,* who were taking advantage of the distressed state of the country from two sucessive seasons of disastrous famine, to swarm through Dināj pur "laying all the principal towns under contribution". Rennell gave information to the Council at Murshidābād, who sent several companies of sepoys to cooperate under his orders. He was not long in seeking out their main body, which was severely handled and driven across the borders of Purneah in complete disorder [293].

It was just before this that he had an adventure with a leopard which had jumped upon him, after wounding five of his men; he succeeded in killing it by thrusting his bayonet down its throat[6].

We find but few references to duties other than survey. In 1770, the Chief at Dacca writes, "I have delayed to forward a plan of a building I would propose to erect in the Kelleh [fort] for the purpose of accommodating the Supravisor and his Assistants, as well as for transacting the business, because I had no one who could give me a design; Captain Rennell is lately arrived here, and at my desire has prepared a Plan and Elevation of a Building which I submit to your approval before it is carried into execution. Conceiving that it will be the most expeditious method of Building by Contract, I desired Captain Rennell, together with the plan, to give in proposals for executing, in case he should be wished to undertake it upon contract." Rennell's estimate was to build it for Rs. 24,825/6/3, excluding the cost of old bricks from the fort[7]. So apparently he had acquired some practical knowledge of the duties of an engineer since abandoning his nautical life.

About this time he began to think his surveys were sufficiently advanced to allow him to retire, but was doubtful whether he could afford to do so. As early as 1764 he had written; "I hope to return to my native Country in a very few years in easy Circumstances, as I have only set my mind on 5 or 6000 pounds. My allowances on my present Establishment are £ 900 sterling per annum, which with other perquisites amounts in all to just a 1000, and I can enjoy, my Friend, my bottle and all the necessaries of Life for 400"[8].

It is difficult to see how he got at these figures, for even after he had been made Surveyor General three years later, he only drew Rs. 600 a month as S G. and Captain, or with exchange at 8 rupees to the pound, £ 900 a year [274]; he also drew Rs. 518 for the pay of his assistants and followers, but could hardly regard this as "perquisites" [276]. Another source of income was however open to him for the first few years of his service, and that was Private Trade, which was the established right of all civil servants, and open to military officers in a small way. His letters make scattered references to his moderate success in this line;

16–11–67, Left in Calcutta £ 800 to be remitted to England. "The Company has forbidden Europeans not in their service to trade in Bengal, and many such are starving in Calcutta. ... I am no small sufferer by the restrictions laid on trading, as I cannot at present employ above half of my little Fortune".

1–7–68, No fortunes now to be made in Bengal. ... Allowed to remit only £ 250 a year.

20–7–69, Cannot yet return to England, having saved only £ 6000.

[1] Fleming Martin De Gloss; Huygens. [2] Nothing further is known about this. [3] HMS. 765, 1–7–68. [4] Map, B M.K; 115 (147. la). [5] BSC. 22–10–72. [6] HMS. 765. 8–2–71. [7] BSC. 10–11–70. [8] HMS. 765, 1–9–64.

1–9–70, Owing to poor health determined to retire in 1771. ... Company's servants confined to trade in cloth and tea.

30–10–70, Has £ 2500 worth of cloth lying unsold in Calcutta. Cannot return to England as soon as he expected as his survey will not be finished[1].

12–11–71, to Robert Palk, "By the Regulations I find myself too rich a man to partake of the provision [a pension]. ... If the makers of these Regulations think that a man can subsist genteely on the sum allotted, my only wish is that their fortunes may be stinted to it. ... I find myself very well during the cold season, but the heats and damps of the other season are too powerful for the present relaxed state of my nerves. I could therefore wish myself at home"[2].

11–11–71, To Burrington, sends instructions about his money, which he thinks will ultimately amount to about £ 9000. Is eager to go home. India is too unsettled to leave property in, so he wishes it well secured in England, where he will probably marry, as he is now scarce 29 years of age.

4–1–72, Nearly died of fever in November.

15–3–72, Is disappointed to hear that it will be difficult to keep a family in England on £ 300 or £ 400 a year, but intends to try to do so.

7–9–72, Having thought over the dearness of living in England, proposes to stay longer in India. 'Tis impossible that I can go home this year, as I cannot remit a single farthing. ... I have tried my interest with the Council to get me recommended for a Pension.

"My expences during the last year have been nearly £ 1000 a year. With that sum a Batchelor can keep a handsome table, a sufficient number of servants, and a Carriage. House Rent I am allowed by the Company, as being in their service, and of late I have been settled at Dacca, where the different rates of living between that and Calcutta bear the same proportion as between Country and City in England : by this you may judge how expensive living it is in Calcutta. I came down here on business with the new Governor [Hastings] about six weeks ago, and in about six weeks more shall return to Dacca, where I shall be settled for...14 months more ; and then...go to England". His very next letter announced his marriage.

In 1765, when he was not yet 23 years of age, he had written to his guardian, " I have had some thoughts of getting a Partner (if I could meet with an agreable one) but I find that Families are so very expensive in this Country, that I am afraid to venture ; so that I must endeavour to mortify those desires till my Arrival in England".

The story of his engagement and marriage is here quoted from *The Thackerays in India*. "In 1771, William Makepeace Thackeray, grandfather to the novelist, was transferred from Calcutta to Dacca to be Factor. ... He took with him his two sisters, Henrietta, aged 25, and Jane aged 32. The elder sister, although not a beauty, was a kind unaffected woman, of whom her mother predicted, if there is a sensible man in India he will find out Jane. One of the most sensible had already found her out while on a visit to Governor Cartier in Calcutta, and was waiting at Dacca to welcome her!—James Rennell. ...

"In the autumn they became engaged, and next year the family party went on a visit to Mr. Cartier in Calcutta". Jane was married from Mr. Cartier's house to Major Rennell on 15–10–72, and they returned to Dacca[3].

Their first child, born July 1773, died a year later, and Rennell wrote; "I had lost my little girl, who promised to be a sprightly healthy child, but unfortunately died in cutting her teeth. God Almighty, I hope, will give me another"[4].

Quoting again from Hunter, "A silver model of her tomb ...still remains an heirloom in the family. ...

"The loss of their firstborn, the common tribute paid by our predecessors in India for British rule, combined with Rennell's ill health from wounds and fever to make them cast longing eyes homeward. ... They got their only change of air by voyaging up and down the rivers in thatched country boats. Their sole sanitarium was the Chittagong coast-strip, ...now considered a malarious tract, then the one poor health-resort. ... Writing thence in 1776, Rennell described it as the Montpelier of Bengal" [374][5].

Jan. 1776, Rennell, writes of his prospects of retiring, "I thank God Mrs. Rennell and myself look no further than for the mere conveniences of life ; so that what would be a trifling pittance to many, will be affluence to us"[6], and later, "Mrs. Rennell remains at Dacca for the present, as journeying in this part of Bengall at this Season, will not suit with women. And having mentioned Mrs. Rennell I cannot help repeating how supremely happy I am in possession of such a woman "[7].

After his marriage Rennell occupied himself mostly at Dacca, compiling his maps of Bengal, a complete set of which he submitted to Government early in 1774 [224]. Later in the year Government ordered the withdrawal of all surveyors from the field, and Rennell continued at Dacca, filling in and extending his maps from such material as he could collect, [33–4, 226]. His health gave him much anxiety; in Feb. 1775 he wrote to Hastings, from Dacca. "Honorable Sir, On the 3rd inst. I had the honor to inform you that I was under the necessity of changing the air; I am now returned to this place, and am nearly in the same reduced state as when I left it. ... As a sudden turn of my disorder may make it necessary for me to remove either to Chittagong or seaward, I request the favour of your permission to proceed thither if necessary "[8].

He now felt at liberty to close his labours in the unattractive, unhealthy, country of Eastern Bengal, and sent in his first request to retire on a pension, in those days an almost unknown privilege.

"My Circumstances and Situation in Life reduce me to the necessity of making the following Application to you, in hopes that by the favor of your Patronage, my case may be represented to my honorable Employers; from whose Justice and Humanity alone I may expect the accomplishment of my just Desires; namely the being enabled to retire from this Country; where, by means of a painful and laborious Service of 13 years, and by various Accidents of Wounds and Sickness, my health is so bad, that I am advised by my physicians to lose no time in quitting a Place, in which I have experienced no tolerable degree of Health for these eight years past; and in which if hard Necessity compels me to stay, I can only expect to linger out a few years longer. Yet, however necessary it may be to change my Situation, the slenderness of my Means will not permit me to live in England, encumbered as I am by a large Family[9], and disabled from pursuing any active Employment by reason of my Maims, and the

[1] HMS. 765. [2] *Palk MSS.* (167). [3] Hunter (73–8). [4] HMS. 765, 26–12–75. [5] Hunter (96). [6] *Palk MSS.* (260). [7] HMS. 765, 16–10–76. [8] BPC. 24–2–75. [9] His wife only.

ruined State of my constitution; unless my Honorable Employers would generously assist me"[1].

In forwarding this application to the Directors, the Council wrote; "He has resolved not to leave India before he has completed the work which he has still in hand. His wishes afterwards are centred in retiring with a competency. ... Capt. Rennell himself began this business, and has carried it on in a manner hardly to be equalled. ... Besides, his total abstinence from any obnoxious pursuits of Wealth, added to the Perseverance and Courage manifested in the Dangers to which he has been frequently exposed, render him an Object really deserving of your favour"[2].

The Directors replied in guarded terms which hardly gave Rennell the assurance he was looking for;

"We approve of Mr. Rennell's promotion to Major, and have taken into consideration your very earnest recommendation of him for a further Gratuity, which we are induced to think will merit our further consideration when he returns to England"[3].

But Rennell was most anxious about his health; "If the Chittigong air does not speedily recover me, I must go to Madras; if I recover, I shall return to Dacca, where I am building a Magazine &c. I heartily wish that I was enabled to try my native air, but the state of my receipts will not allow of it. I had hopes of the Company, but their last General letter speaks in too *general terms*. ... After my last illness of Jany. and Feby. 1775, I enjoyed better Health than I had experienced at any time since I received the wounds in 1766; till the beginning of June last, when by an inconsiderate trick of bathing in cold water whilst overheated, I was siezed with an inflamation in the Bowels, and had a narrow escape. My Bowels have never been composed since that time, and I have just removed to this Place [Islamābād, or Chittagong] which is reckoned the Montpelier of Bengall. This is a hilly Country bordering on the Sea, and at the S.E. extremity of Bengal"[4].

To the Council he made this further application, "A trial of my native air has long been advised, although the slenderness of my means has not allowed me to make the experiment. But now that I have a prospect of being made easy at the conclusion of my labours, I shall cheerfully exert myself during the course of another year; at the close of which I expect to see my work compleated; and I then propose, with your permission, to go to England, and avail myself of the promises of the Honble Court of Directors.

"But as I desire not to eat the bread of idleness, but rather to make myself as useful as possible even after my return to England, I take the liberty ...to submit...a scheme which I flatter myself you will approve of"; his scheme being to work up "a General Map of All Hindoostan" from the material collected at the India House [212][5].

The Council took prompt action, and not only forwarded Rennell's address with a strong recommendation, but on their own responsibility gave him permission to return at once to England; "The great decline of Major Rennell's health, owing partly to the intemperature of the climate, to which the nature of his employments has unavoidably exposed him, and partly to the dangerous wounds which he received from Sinassies and others in the course of his Surveys, & the state of his fortune, which even after a long period, the most useful of services, is too slender to admit of his retiring to England without some certainty of support, have induced us to go beyond the letter of his request, and as the best means that occurred to us of fulfilling the benevolent intentions which you have been pleased to expressed towards him, ...we have agreed unsolicited to allow him to retire to Europe upon a pension of five hundred rupees per month, being merely the amount of his pay without Batta, subject to your confirmation or reversal. ..."

"We think it incumbent on us on this occassion, to place his character in the strongest point of view, ...by calling to your remembrance that you owe to his genius and unremitting labours, a compleat Geographical Survey of those extensive Provinces, begun and finished under his direction, and a great part of it executed immediately by himself"[6].

Rennell was busy right up to the last, having, since Oct. 1776 persuaded Govt. to send out surveyors to fill in various gaps [35–6]; he issued his last detailed instructions, submitted his final reports, handed in his instruments, and sailed from Calcutta 9–4–77.

The following extracts are taken from letters written just before he left India;

21–12–76, "The Governor General & Council have now settled a handsome pension on me for life (subject however to the Confirmation or reversal of the Company at home) payable in Bengall, but to be remitted annually to England; ...Rs. 500 a month which may be reckoned about £ 600 per annum".

5–2–77, "I am now on my way to Calcutta in order to embark on the Ashburnham. ... My present dependence is on the Company's pension; as I have by no means enough of my own to live on".

4–3–77, "My Health is greatly restored. We left Dacca the 2nd February and arrived here [Calcutta] the 20th. ... I think the mercantile part of this settlement is advancing fast towards ruin"[7].

He wrote to Warren Hastings after arrival home, "You will have heard, Sir, that we stayed four months at St. Helena, *waiting* for a little girl, which we have brought home with us. During that time I made a survey of the Island, and Fortifications: and, I believe, made a pretty compleat investigation of the strength...of the latter"[8].

He wrote to his guardian, 24–2–78, I have been in Town several days, and yet have but just finished the Task of visiting the Directors and other great People. I can form but a poor judgement of what they intend doing for me; it will be little I fear, but I will not lose it for want of application. ...

"My present lodgings are in Oxford Street, near the corner of Orchard Street, No. 199, and I believe I shall keep them some time in preference to my old lodgings in Surrey St., Strand".

Again, 5–3–78, "When I set out for Devonshire, I shall take Bath in my way, in order to visit Russell and Richards", staying with his friend Russell[9].

26–1–81, he wrote to Hastings from "Nassau St"[10] [377] "I am now settled in town; having taken a house for a term, and furnished it"[11].

[1] Petition, 25–9–74; V M. Exbt. 1884. La Touche (3 n.). [2] B to C D. 17–10–74 (60). [3] C D to B. 5–4–76 (8). [4] H M S. 765, 16–10–76. [5] B P C. 5–12–76 (5). [6] B to C D. 19–12–76 (56). [7] H M S. 765. There have been pessimists in the Calcutta business world since 1777. [8] B M Addl MSS. 29140, 1–5–78 (343). [9] H M S. 765. Probably not George Russell, the surveyor [382–3]. [10] Now Suffolk St. Cavendish Sq. [11] B M Addl MSS. 29147 (191).

He was always fond of Bath, and wrote from there, "I am somewhat better for the change of air, and have begun to drink the waters"[1].

His first anxiety after reaching London was to get the Directors to confirm his pension, and he writes to Hastings, 1-5-78, "My business was finished at the India House last week; & I am to have £400 a year paid in England, in lieu of the pension which you were pleased to fix for me in Bengal. I am confident, (I was so before I left India) that any sum you had fixed would be *beat down* here by men accustomed to drive Bargains. Not but that a few of the Directors, more liberal than the rest, wanted to give me the whole; but were overruled. Be it as it will, it is a very handsome Pension, and I once more thank you for getting it for me, and I shall still continue to thank you during the course of my whole life"[2].

The Directors wrote officially to Bengal, "Having maturely considered your recommendation in favour of Major Rennell, and the many and signal Services he has rendered to the Company, and finding that, in consequence of the sufferings and hardships he has undergone in the course of a long painful duty. he is disabled from continuing longer in India. We have resolved to gratify him with an annuity of 400 pounds, payable in England, in lieu of the pension of 500 rupees per month which you had allowed him"[3]. This annuity was to commence from Christmas 1777.

Two years later, on his own application, the Directors raised the pension to £600 a year, equivalent to the sum originally suggested by the Bengal Government[4].

After he had settled down in London Rennell's first thought was the engraving and publication of his Bengal maps; he could not persuade the Directors to undertake this, but they made him cash advances, and allowed him to send copies out to Bengal by Company's ships [167 n.1,229]. The first consignment was sent out before July 1780, and other editions followed in rapid succession and were soon sold off [228–30]. This promptness in getting the work of the surveyors out to officials working in the country is a striking instance of Rennell's public spirit and enterprise, and a great contrast to the official policy of the period.

Even before the printing of the *Bengal Atlas* began, he had made a start on the compilation of his *Map of Hindoostan*, and had the first edition ready by the end of 1782 [4–5]. A full account of the several editions has already been given [212–5]. Perhaps his most striking innovation was in showing the Tsangpo and Brahmaputra as one river [78–80, pls. 1, 14], whilst one of his most notable archaisms was the retention of the strange westerly sweep of the upper Ganges [71–3, pl. 1].

More important than the maps were his *Memoirs* which gave a detailed account of their construction, and established him as a geographer and man of letters; he fell naturally into the position of the Company's adviser on all geographical matters though he held no official appointment as such [164, 217 n. 2, 251–2]. 1781, he was elected F R S., reading a paper on the Ganges and Brahmaputra, which, besides discussing their origins, described the extraordinary changes effected by action of their floods in the low lands [79, 213][5]. In 1791 he was awarded the Society's Copley medal. In 1792 he published a special map to illustrate the campaigns in Mysore, and such was his promptitude to "sieze the opportunity" that by the end of the year he had got out a second edition to illustrate the cessions made by Tipu at the Treaty of Seringapatam signed in March [111]. He also produced a new edition of his map of the South Peninsula shewing the great additions made to geography by the campaigns of the 3rd Mysore War; issue was made on December 7th, which, considering the six months transit between India and England, and the time required by engraving, indicates a promptness that would hardly be outdone in the 20th century [244].

Rennell was particularly unselfish in the help he gave to other authors in advice or the provision of geographical material, and often in the compilation of a special map.

1796, the Directors consulted him about Colebrooke's proposals for cutting a canal between the Ganges and Hooghly rivers; and in his reply he remarks; "The advantages of a nearer route to and from Calcutta and the Upper Provinces... has always been self evident; more especially as the direct passage continues to be shut up during so large a portion of the whole year. ... But this evil arises from natural causes, and which appear to be not easily remediable. ...

"I am clearly of opinion that unless the opening from the Ganges...downwards to...the place proposed to be cut through, should be found to be of a sufficient depth, at the driest season, that *no expence whatever* ought to be incurred, for admitting a bare sufficiency of water *now*, the chances are *against* its continuing open long"[6]. ... The proposal was abandoned, and Rennell's arguments have not since been refuted [64].

1791, he advised against the publication of Call's Atlas, as the map over which so much labour had been spent was already altogether out of date [217].

He now extended his interests to other countries. Between 1800 and 1810 the whole of Europe became interested in Persia as a possible scene of Napoleon's ambitions, and Rennell corresponded with Warren at the Madras Observatory about material for a map. Warren was able to supply work done by Webbe and Pope with Malcolm's mission of 1800 [286], and wrote, 25–2–1807, "I shall...always feel particularly gratified that the temporary charge... has afforded me an opportunity of communicating with a person so eminently entitled to the veneration of all Geographers, and particularly of those whose long residence in this country has enable them fully to appreciate the merits of your extensive and important labours". To which Rennell replied, 1–3–1808; "You flatter me most agreably when you tell me that my labors have been beneficial to the society in which you are at present", and went on to refer to his own work as that of a pioneer [Title page, 215].

[1] To the Directors, 15–5–84. Misc L R. 174 (177). [2] B M Addl MSS. 29140 (343). [3] C D to B. 7–5–78 (18). [4] C M. 7–11–81. [5] *Phil. Trans.* lxxi. 1781 (87). [6] D D. 114 (a), 10–3–96.

He wrote again 17-1-1809, "I am now constructing Southern Syria and Lower Egypt, which is all that remains to be done in the 6th sheet of the Comparative Geography, the 5th, which includes all your matter, being now in the Engraver's hands. The French Book on Egypt is not arrived, nor has Bonaparte allowed any one Book published in France for near 18 months past to come to our hands; so that the King of a country prevents his subjects from obtaining their full measure of Fame; for surely the French Savants look to this country for a large portion of it, as we to them. Nothing can shew the littleness of a *mind* so much as this; no one is to be a partaker of Glory with him".

Regarding this major work of his, an *Atlas of the Comparative Geography of Western Asia*[1] [208] he continues, "Lord Grenville, before his resignation, obtained from His Majesty a grant of £ 2000 as an aid towards the execution of my work (estimated at £ 3000). His Lordship went out late in March 1807, but I did not get the money till July, when the Engravers were set to work"[2].

Rennell had correspondence with Warren Hastings on a number of subjects; and in 1802 Hastings, in a paper on the subject of Ocean Currents [377], commented thus on an earlier paper by Rennell; "Of the nature of these currents no scientific account was ever given to the Public till the year 1797, when Major Rennell printed a short tract accompanied with a Chart of the South coast of Africa, in which the lines of the currents setting round that coast were accurately laid down and described. The authority of Major Rennell on all points of a Geographical nature, but more especially such as are connected with the Geography of India, is unquestionably of the first credit, due not more to the numerous authentic materials to which he has access, than to the peculiarity of his talents, and the industry and sagacity with which he is known to have applied them. This praise is not mean as a compliment to him, but to impress my sense of the truth of these documents"[3].

Rennell was not happy in his criticisms of Lambton's proposals for a Trigonometrical Survey, which had been referred to him in 1800 together with Mackenzie's Plan for the survey of Mysore. Lambton's proposals had been entitled *Plan of a Mathematical and Geographical Survey,* and Rennell quite misunderstood them; he assumed that Lambton meant to carry out independent astronomical observations, to which Mackenzie and his assistants would tie their topographical survey, and he argued that the plan was wasteful and unnecessary. He also quite misunderstood the proposals for Dr. Heyne's Botanical survey of Mysore, and for establishing a Botanical garden at Bangalore; "the plants of the country, meant to be collected into it, must of course grow spontaneously in the country itself".

Both Lambton and Mackenzie were put to much pains to answer his criticisms, and their replies completely satisfied the Directors and Rennell himself. The criticism was however very disturbing to Lambton, who was fighting a lone hand in support of his large ideas; and the following comment by Warren is particularly interesting, as he was serving with Lambton very shortly after Rennell's note had arrived;

"We think very highly of the father of our Indian Geography, and yield to no one in admiration of his sagacity and skill in combining heterogeneous materials, and extracting from conflicting statements results so nearly approaching to truth, as to leave little to his successors beyond the task of confirming his statements, but...science was not his forte, ... nor had he carried his acquirements in mathematical learing to the level of his contemporaries in Europe. ... Colonel Wellesley might justly observe, in comparing his opinion with that set forth in Colonel Lambton's prospectus, 'one or the other must be very ignorant'. Maskelyne, then Astronomer Royal, at the request of his relative Lord Clive[4]... having explained to Major Rennell the real nature of the survey, the latter very handsomely came forward and declared to the Court that he had been misinformed; and wrote also to Capt. Lambton to urge him to prosecute his labours[5]".

Warren's paper first appeared in a Madras newspaper soon after Lambton's death, and this is probably the first recorded reference to Rennell as "the Father of Indian Geography", an expression also used by Blacker in a letter to Govt. dated 3-3-24[6].

In 1823 the Directors were discussing their scheme for the $\frac{1}{4}$-inch Atlas of India, and wrote out, "We have caused enquiry to be made of that distinguished Geographer Major Rennell as to the best mode of obtaining a complete map of India within a reasonable time, and we transmit...a copy of a memorandum which we have received from him"[7].

Rennell had been more impressed with the necessity of speed in order to cover the enormous area of India than with any thought of high accuracy or permanence; and wrote, "The survey in contemplation can of course be no other than a very General one; ...a general delineation of the roads, mountains with their passes, courses of rivers, and boundaries of the large districts, and not a military survey, is required.

"All idea, therefore, of mensuration, or of a series of triangles over the country, is out of the question, and according to my opinion, the only mode in which the work can be accomplished with such a degree of general accuracy as is consistent with the required dispatch, is to obtain, in the first instance, a series of celestial observations of latitudes and longitudes, by which a sufficient number of geographical points at proper intervals may be determined, in order to regulate the scale of the map, and to furnish the means of correcting that of the cursory surveys, by which the intervals between those points must be filled up"[8].

He worked out details of such a scheme, and advocated the appointment of a special astronomer, with an assistant, to lay down the points of control, instead of continuing the Great Trigonometrical Survey.

His note was written a few days before Lambton's death, so it fell to Valentine Blacker, during his first year as S G., to make reply; which he did in an able letter pointing out the unsatisfactory nature of astronomical control, and the urgent importance of the rigid framework of GTS.; "The character of that distinguished geographer for talent, industry, and literature, is so well established that his opinions on the subjects to which so much of his attention has been successfully directed, claim immediate respect. But there is a distinction between geography and geodesy; and the latter is the object of the present inquiry. Notwithstanding Major Rennell's

[1] Pub. 1831. [2] M P C. 18-7-1809. [3] B M Addl MSS. 29233 (213) & 29178 (135). [4] Governor of Madras, 1798-1803.
[5] *Gleanings in Science*, II (77) March 1830. [6] D Dn. 204 (60). [7] C D to B. 29-10-1823 (50). [8] D Dn. 205 (48), 28-2-1823.

celebrity chiefly rests on the ingenious use and sagacious reasoning with which he has turned to account a variety of uncertain authorities [213], and that his Bengal Atlas, although said to be founded on actual survey, depends neither on measured base or triangulation, ... he is evidently aware that transcendent geodetic methods are now employed in Europe, however he may have overlooked their later progress in this country"[1].

Blacker agreed, however, that there were tracts, such as Bengal, "whose nature forbids the approach of the Great Trigonometrical Survey", and that astr. control would have to be employed in these, though on somewhat different lines to those proposed by Rennell.

It should be remembered that at the time he made these recommendations Rennell was over eighty years of age; he was unable to realise that India was now very fairly covered by cursory surveys of the nature he was recommending, and that all surveyors were employing astr. control of a sort, except where the G T S. rendered it unnecessary. What was now wanted was a uniform map of a higher class altogether.

It is not possible here to go into all the varied interests which filled Rennell's later life. As Markham writes, "Though Rennell continued to labour zealously in the interests of Indian Geography for the remainder of his life, he welcomed all geographical material, and warmly supported all explorers. His great work *The Geographical System of Herodotus examined and explained* was pub. 1800, and in 1816 it was followed by his *Geographical Illustrations of the Retreat of the Ten Thousand*. "In 1798 he was assisting Mungo Park in the arrangement of his African travels[2]". He devoted much attention to the subject of winds and currents of the Indian Ocean [376], making a study of the log-books of the Indiamen, and his conclusions, entitled *Investigations of the Currents of the Atlantic Ocean*, were published after his death.

Amongst other publications were, *Result of Astronomical observations in North America. 1794.—Atlas of Western Asia*, in six sheets, 1800–1810.,—besides numerous papers pub. in the *Philosophical Transactions* of the R S.

His name has been given to an island off the coast of Chile, and to one of the easternmost of the Solomon Is. in the Pacific, to an ocean current near the Scilly Is., a mountain in North Canada, and a bay in British Columbia.

He was Foreign Associate of the Institute of France, 1802, of the Imperial Academy of St. Petersburg, and of the Royal Society of Gottingen.

1825, he was awarded the gold medal of the Royal Society of Literature; "The Royal Society of Literature have presented to this venerable gentleman one of their gold medals. On the 5th May, a deputation waited upon him, at his own house in Nassau Street, consisting of the President, the Bishop of St. David's, Sir Wm. Ouseley, Archdeacon Nares etc., when the medal was presented by the Bishop"[3].

In describing the original foundation of the Royal Geographical Society, Professor Mill says that Rennell had often discussed with the members of the African Association and the Raleigh Club the possibility of founding a *Goegraphical Society*, but that he "died while the Society was being organized, or he would have been the most honoured member of its first Council. He received the posthumous honours of a founder, for on the centenary of his death, 29–3–1930, the President and Council of the Royal Geogrphical Society attended the morning service in Westminster Abbey, and laid a memorial wreath on his grave, close to that of Livingstone, and marked only by the initials J.R. and the date[4].

So much has been written[5] of his personal charm that we need only add the following extract from a letter he wrote to Warren Hastings from Nassau St., 10–9–1816, "Capt. and Mrs. Rodd are in Cornwall, and have taken away with them my little playmate, their son'[6].

He lived to a ripe old age; "After he had reached his 86th year he possessed the full vigour of all his intellectual faculties, and though suffering little short of martyrdom from frequent attacks of the gout, he still devoted many hours of each day to his favourite pursuit"[7].

"When upwards of 87 years of age, he slipped from his arm-chair, and broke his thigh. He hardly left his bed again, and died on March 29th 1830"[8].

He was buried at Westminster Abbey, and the Abbey Register shows that he was "buried at noon of 6 April 1830 in the nave of the Abbey by the Very Reverend The Dean", and notes the expenses for his coffin and the penalty for "burying in Linen".

On a window ledge of the Chapel under the NW. Tower, at the west end of the nave, is a bronze bust by Hagbolt, and a tablet with the followlng inscription; "Major James Rennell—Died March 29 1830—In his 88th year—His useful life—Firm character and high talents—are amply exhibited in his work—and need no other Monument. This Tablet—therefore merely records—that this celebrated man was buried—near this spot".

In 1903 a bronze copy of the Hagbolt bust, specially made by W.H. Thorneycroft, was presented to the Victoria Memorial at Calcutta by Sir James Rennell Rodd, later Lord Rennell[9]. A plaster copy is at the rooms of the Royal Geographical Society.

There are in the family two coloured wax models by Hagbolt, obviously taken before the construction of his bust, and also a Wedgewood plaque, whilst a third wax model "was presented to Sir Henry Yule by Major Rennell's only surviving grand-daughter in 1882. He left it to Sir Joesph Hooker in 1890, who presented it to the Royal Society"[10].

There are three porcelain medallions, executed at Sèvres "from a model", inscribed on reverse "Portrait fait en 1826". Lady Rodd presented one to the Royal Geographical Society, one to the Asiatic Society of Bengal, and, apparently one to the India Office, which was transferred to the South Kensington Museum[11]. In her letter to Calcutta, 27–12–1843, Lady Rodd writes; "Her Ladyship had it excuted at Sèvres, during her late visit to Paris, by desire of the French Institute, and she feels anxious to send a copy to India, where Major Rennell's fame has ever been duly appreciated"[12].

[1] S G. to Govt. 11–8–1824 (50 to 54). [2] The Account of Mungo Park's first expn. contained *Major Rennell's Memoir on the Geography of Africa* with maps; 1817; Markham (401–2). [3] *As J.* XIX (83). [4] Mill (21). [5] Hunter (73–8); Lady Ritchie in "*L'Art d'Etre Grandpére*" in *From the Porch*, 1913. [6] Mrs. Bayne's *Memorials of the Thackeray Family*. BM Addl MSS. 29190 (516). [7] Markham (402). [8] Porter (401). [9] V M. Exbt. 396; photograph on pl. 9. [10] Century Series (323–4). [11] Yule (Frontispiece & p. 2). The Calcutta medallion has been reproduced in *Ben. Atlas*, reprint of 1911; La Touche; & *Ben. P & P.* X (183). [12] *Progs. As. Soc.* 13–11–1844 (1014).

It is obvious that these medallions were made from one of Hagbolt's wax models, which must therefore have been taken at least four years before Rennell's death.

In his biography of Rennell, M. Walckenaer, Sec. of the Institut de France, writes of these medallions; "Le portrait de Rennell a été trés bien gravé, et un beau basrelief de sa tête, vue de profil, a été exécuté en porcelaine par les habiles artistes de la Manufacture de Sèvres. Son éloge a été prononcé dans la seance publique de Institute de France, le 2 août 1842, par l'auteur de cet article"[1].

There is also a marble bust, sculptor unknown, bequeathed to the National Portrait Gallery in 1892 by Major James Rennell Rodd, Lord Rennell's father. This was apparently taken from a death mask; it has several slight differences from Hagbolt's bust and has not the same kindly expression[2].

The following portraits are known;

First: A small oval painting in uniform, painted in India when he was about 35 years of age, viz. *c.* 1777, making a pair with a similar one of his wife, now with the Hon. Francis Rodd.

Second: A crayon portrait,[3] half length, in profile to observer's left, signed by George Dance, 15–2–94, now in the National Portrait Gallery[4].

Third: A miniature by E. Scott, painted for Lord Spencer a great friend of Rennell.

This was engraved, first by A. Cardon[5], pub. in 1799. and again, slightly smaller, by W. Ridley, pub. in the *Eur. Mag.* of 1802, and reproduced here on pl. 19[6].

There is a distinct resemblance in character and pose between these three portraits, which represent a man of under 40, rather than 52, as Rennell would have been at the time of the Dance portrait.

Fourth: A portrait in oils by Opie, of which nothing was known till after 1930, in the possession of the Hon. Francis Rodd. It represents a man rather older than is shown in the portraits already described. We have, however, no evidence that Rennell ever sat to Opie who d. 1807.

The following additional particulars are given about Rennell's second son, William, who obviously did not inherit his father's abilities and character.

Ben. Civ.; Writer 1–11–98; arrd. Calcutta Jan. 1800 with introduction from his father to the G G., Marquess Wellesley[7].

From 1812, Collector of Dacca, where he was not a success as he was " not qualified for the proper discharge of so responsible an office; ...nevertheless not incompetent to the exercise of public functions of an easier and less responsible nature".

29–3–1816, Appd. Depy. Collector of Customs at Benares "a situation which involves the performance of comparatively easy duties"[8].

d. Fatehgarh, 25–7–1819, without issue.

m., before 1815, Miss Millicent Lucas, who d. Fatehgarh 1828, mentioning in her will her mother, Mistress Millicent Lucas; her bro. Mr. Robert Lucas; two sisters Elizabeth and Sarah Lucas; a sister Mistress David Todd, and a sister Mistress William Browne; also her sister-in-law Mistress Rodd of Devonshire[9].

REYNOLDS, Charles. Bom. Inf.
b. *c.* 1756–8. d. 24–6–1819.

Ens. 20–7–75 ... Lt. Gen. 4–6–1814; Resd. 2–3–1807[10].

S G. Bombay, 1796–1807 [265].

A bro., William, attorney at Folkestone, had two sons, George and John, both on Bom. Est.

m., 1811, Mary (Williams ?), who d. at Pigeon House Ft., Dublin, 5–10–1834.

Left a dau. Elizabeth Ann, and two sons, Charles Williams and John Williams. A niece, Elizabeth Reynolds m. Wm. Lenn, Bom. Inf., 4–11–1816.

His portrait by Raeburn [pl. 20] was sold at Christie's, 14–3–1930, for 3,650 guineas; and one of his wife by Sir M. A. Shee, exbt. Royal Academy 1818, sold for 480 gs.

E I M C. III (87); Sandes I (102).

MI. St. John's Church, St. John's Wood Road, London.

Arrd. India 1772 at age of 14; "Entering immediately...on active service, he continued during the course of the twelve following years in the Hon'ble discharge of his professional duties, including those of an Engineer, ...against the Mahrattas and Tippoo Sultaun, from the reduction of Broach [18–11–72] till the attacks on Dubhoy [18–1–80], at which he was wounded; and thereafter on service with General Goddard, at the reduction of Ahmedabad [15–2–80], the siege of Bassein [captured 11–12–80] and the capture of Arnaul; and on the occasion of that General's memorable retreat from the Ghauts to Panwell [April 1781], at which arduous crisis... was attached to the Rear Guard of that Army, and was twice wounded"[11].

During these campaigns survd. many routes on his own initiative besides part of Broach *pargana* [122].

Dec. 1782, Appd. "Secretary to Brigadier General Mathews, and Surveyor General to the Army [265]" sent from Bombay to Kanara, and "having...proceeded in Command of a Detachment of six Grenadier companies of native Infantry...had thence the opportunity of bearing a very creditable share in the lengthened and gallant defence of Onore, which was not given up till the Peace of 1784[12] [125]".

Survd. about 60 miles of coast and country up to the Ghāts [125, 176–7] before being shut up in Onore. In forwarding his map to the Directors, the Council described him as "one of the most promising and valuable officers on our Establishment"[13].

On return to Bombay, appd. Survr. [265, 273], and put to survey Bombay and Salsette Is. [120,147].

Early 1785, deputed to accompany Charles Malet on mission to Sindhia, and survd. route through Mālwa to Muttra [6, 126–7, 253–4]. Sindhia did not welcome the mission very warmly. Amongst his presents to Malet was an ornament composed of false stones, but this was probably nothing unusual, for the presents received from the Emperor at Delhi included "false jewelry, a broken-down pony, and an elephant with a great ulcerated wound on its back"[14]. The party then marched to Cawnpore and thence by river to Calcutta, returning to Bombay by sea [127].

Early the next year Malet and Reynolds went up to Poona and joined the Peshwa's army at Bādāmi, where the Marāthas were at war with Tipu. This gave Reynolds his first line of survey through the unknown country of the Deccan. Pleading that the climate of Poona did not suit him, he then marched down to Surat by another new route, and made his regular headquarters there till the end of his service [127–8, 177, 205].

[1] *Bibliographie Michaud* XXXV (429). [2] Exbt. 896. [3] Reproduced, Thackeray (11) & (reversed) Sandes II (188). [4] Exbt. 1153. [5] Reproduced, Century Series (Frontispiece), & Mill. [6] Cardon & Ridley were contemporary & independent. [7] B M Addl MSS. 13714 (3). [8] B. Rev to C D. 1–11–1816 (76). [9] Ben Wills, 1828. [10] C D to Bo. 7–9–1808 (10). [11] Bo G O. 10–2–1807. [12] ib. 10–2–07. [13] Bo to C D. 28–12–84 (9). [14] Narrative by Surg. Cruso; Forbes IV (1–106).

JAMES RENNELL,

SURVEYOR GENERAL, BENGAL; 1767—77.



From the portrait in ***European Magazine***, 1802, engraved by W. Ridley from miniature painted by E. Scott.



From the Bust by W. H. Thornycroft, which was copied from Hagdolt's bust in Westminster Abbey. Victoria Memorial. Exbt. No. 396. Photographed by Major G. F. Heaney, R.E.

Plate 19.

Plate 20.



CHARLES REYNOLDS,
SURVEYOR GENERAL, BOMBAY, 1796—1807.

Dec. 1787, Submitted his first map of Western India, which he was proud to explain as a great advance on Rennell's *Map of Hindoostan*, pub. less than 5 years before [121–2, 217]. He continued his routes from one part of the Deccan to another working with as little display as possible, and in 1788 made a remarkable journey through Nāgpur, Hyderābād, Masulipatam, and on to Madras, returning by a different route [115, 127–8]. He was planning yet another journey at the end of the year when he was stopped by orders from G G., who was particularly anxious to avoid offending the Marāthas in view of an impending break with Tipu [6, 128].

April 1790, on out break of 3rd Mysore War, Appd. ADQMG. to the force sent to Malabar under Lt Col. Hartley[1], and during the next two years made the first surveys ever carried out in that country [7, 128, 130, 179]. At the close of the war in 1792 he carried a survey from Seringapatam to Hyderābād and then on through Berār to Agra [116, 132]. We hear of him on the way, through the following letter from the Resdt. with Sindhia;

"Ogeine, 1–12–92. Capt. Reynolds arrived some days ago at Bourhoonpore[2], at which place he...is stopped by information of Aleah Bhye having prohibited the passing of any number of armed men at the Ghaut of the Nurbuddah on his intended route.

"I have despatched a letter to her, requesting to permit Captain Reynolds and his party to pass, and have engaged that they will commit no disturbances in her districts; I forwarded to Capt. Reynolds before he left Hyderabad Passports and Letters of Recommendation from Scindia to his principal Officers"[3].

May 1793, Reached Agra, and there made the acquaintance of Dr. Hunter, who greatly appreciated the interest taken by Reynolds in his surveys [56, 168].

From Agra, obtained permission to go down to Calcutta, where he put forward a scheme that he had been considering for several years, the completion of a large-scale map of Western India, which should deal particularly with the areas beyond the Company's territories. He was given authority to proceed at once on a survey of Sindhia's territories [8, 55] and, besides an escort of Bengal troops with two English officers, was given Blunt as asst. survr., and a special allowance of Rs. 800 a month for contingent expences [282]. When passing through Delhi, he and his officers were received by the Emperor [301–2].

April 1794, Recalled to Bombay to attend a ctml.;, the following particulars of part of his journey from Lucknow being taken from the journal of a travelling companion.

"May 4th. 42 miles from Cawnpore, Capt. Reynolds joined me this morning on his way from Lucknow to Surat, and I was fortunate in the likelihood of having his company for the greater part of the long journey before me".

May 9th, Etāwah, on the Jumna; May 13th, Gwalior; May 22nd. Sironj; June 3rd, Burhānpur.

They marched from 16 to 24 miles a day, travelling in palankeens. Near the crossing of the Chambal Reynolds's servants and escort had a scuffle with some villagers over the requisitioning of a guide; one of Reynolds's *khitmatgars* and two of the villagers were killed, but no serious notice seems to have been taken of the incident[4] [298].

The ctml. at Bombay had to do with the sale of captured goods during the war of 1791 in Malabar, and the allegation was that various officers, including Reynolds, had been making illicit profits.

"A court of enquiry had recommended that Capt. Reynolds should be brought to a Court Martial for his conduct", but the court reported later, "The Officers are still of opinion that Captain Reynolds' conduct was very culpable, but not so much so as they hitherto believed it. In consideration of the very high character which Capt. Reynolds has ever borne in the service, and of his merits as an officer, they consent to drop the prosecution. ... They deem the transaction regarding the purchase of Captured property highly dishonorable, but from what Capt. Reynolds has set forth in his letter, they are inclined to believe his intentions are not so, and that he has been deceived and misled by his associates."

On this report "the Commander in Chief readily agrees to the charges exhibited against Captain Reynolds being withdrawn and the matter dropt"[5].

In forwarding the results to the Directors the Council report "that previous to Captain Reynolds' being concerned in the purchase of the Furrukabad captured property, he bore the most honorable character", and in their reply the Directors "express great satisfaction at the sentence being honourable, and also direct that no other proceedings shall be held respecting Capt. Reynolds"[6].

Reynolds now returned to Surat where he remained for the next 12 years working on his great map [132, 217–9, 246, 248, 253, 258, 282], being appd. S G. on the Bombay est. in Jan. 1896 [265].

There was considerable discussion as to whether he should continue to draw the monthly allowance of Rs. 800 which had been allowed to him by the Bengal Govt. in 1793, especially as he was no longer out on field work himself; but he urged that his expenses, mostly in the pay of his native surveyors, were far greater than would be covered even by this allowance. "My expenses over and above my allowances have added very considerably to the tax on my private fortune; and from fifty thousand rupees at the time of my laying my plan before Government [in 1793] it had increased to upwards of seventy thousand rupees"[7]. [132, 218, 234, 282, 287–9]. He was permitted to retain this allowance in addition to his salary as S G. [282], and in 1799 the Directors ordered that all the expenses of his native surveyors should be charged to Govt. [288–9].

They grew very impatient as year after year went by with the map no nearer completion. Reynolds explained the delay partly by the continuous flow of new information brought in by his surveyors, and partly by the failure of Govt. to give him a capable asst. [218–9, 273].

He was very anxious that the map should be the best possible, and much hurt at what he considered to be obstruction on the part of the S G. in Bengal, alleging that there was reluctance to send him copies of surveys from that side [255, 254–5]; on

[1] Bo S & Pol. 3–4–90. [2] Burhānpur, 55 C/3. [3] B P C. 21–12–92. [4] B M Addl MSS. 13582 (83). [5] Bo M C. 1–8–94. [6] C D to Bo. 23–2–96. [7] Bo M C. 24–4–98.

the other hand we find a friendly enquiry from Mackenzie in a note to Johnson, "Please give my respects to Colonel Reynolds, I hope he is well. Were it possible to procure draftsmen, I should send him copies of the general plan [of the Mysore Survey] but when I go up to Mysore I may have that in my power. Has he any intention of going home?"[1].

At last, after repeated representations, Moncrieff was allowed to join him at Surat for a few months in 1801 [219,357], and by 1804 he had a regular staff of three assts. He was deeply grieved at Moncrieff's death, and writes from Cambay, 17–11–1802;

"I remained at Surat until the 11th when, finding my health somewhat improved, altho' I had an attack of my fever during my stay there, I embarked on my way back and arrived here the 13th: I am sorry to say that...I found the change from Cambay did not preserve me from the fever...having now also the symptoms of the re-approach of my complaint.

"It is this constant succession of ill health, with the consequent slow progress of my work, and the extreme difficulty of my situation from the want of such assistance as similar talents only to what Capt. Moncrieff possessed. ... The affliction I have suffered from Capt. Moncrieff's loss is only known to myself, and to the state of despair it opened to me with respect to my work I attribute much of my ill health. I had more to do than I could get through with. I saw no hopes before me. It was needless publicly to wail. I could offer no remedy. ...

"Apprehensive from the critical state of my health for a considerable time past that I should be forced to quit Cambay for a short time, ...I consulted Dr. Moir, and... requested of him...to meet me at Surat. ... By the last post I have received his letter wherein he states the absolute necessity for my taking immediate steps for my safety, and his willingness to meet my wishes by coming to Surat, but regrets from the present state of the medical line at Bombay the impossibility of his asking permission, there being few of the profession left there to perform the necessary duties.

"My heath is so very much deranged that there is an absolute necessity for my returning to England as soon as possible, and it will be very painful to me that this part of my work should be imperfect when I give it in. ... Independent of the febrile attacks I am so constantly exposed to, I am affected in another way that renders my stay in this country to be actually at the risk of my existence, but I refrain from applying for leave on a sick certificate, in the hopes of being able to finish it here. ...

"From the month of August 1801 to the present month of November, I have had a full eight months of sickness. ... My constitution is so injured and my sickness every year gains ground so rapidly on me, that I do assure you that nothing but the disgrace it would be to me to quit while my people are still detained beyond my power of recall. ...

"Was I ever to preserve my health, my sight is now seriously injured, that I am totally unable to do anything by candle light, or even by daylight, to give the constant application to it I was used to do[2] [237].

At last, Jan. 1807, the map was so far completed that he was able to tear himself away, and depart for England, taking with him a copy of the great work to present in person to his masters in London.

An interesting account of a visit to Reynolds in 1804 is given by James Welsh [219]; "One of the greatest treats, however, which I enjoy at Surat, was the acquaintance of Colonel Reynolds, the Surveyor General, who lived in a garden house some distance from the town; and as he has since...quitted this world for a better, I may venture to express the opinion I then formed without the fear of hurting his delicacy.

"A soldier of thirty three years service in the East, he had suffered much from fever, and yet appeared a hale young man; such is one of the advantages of temperance. With a fine manly person and genteel address, he possessed more knowledge of the country than any man I have ever conversed with in India. ...

"A similarity of pursuits soon leads to confidence and intimacy; I gave Colonel Reynolds copies of my routes in directions where he had not an opportunity of surveying himself; and he very kindly allowed me to peruse such of his manuscripts as contained any information I required.

"At parting, also, he presented me with an English Perambulator, which proved of the utmost service to me in correcting any errors in my late routes after leaving the army; having brought a theodolite only to take bearings, and computing my distances by a watch"[3] [184].

After receiving a copy of the map the Directors expressed themselves satisfied "that Colonel Reynolds has fully established his claim to remuneration, ...and, taking into our consideration the labour and magnitude of the work itself, the expences incurred by Col. Reynolds, both in the early stages of the Business ... and subsequently in its progress, from inadequate amount of the allowances granted him; taking also into consideration...that he forebore to draw any part of the field allowances attached to his rank or situation, ... which according to a calculation made here may amount to about Rs. 75,000; We have on all these accounts resolved to present Colonel Reynolds with the sum of Two Lacks of Rupees as a remuneration for his services in the Execution of the Map as compensation for all claims, ... at 6% per annum from the period of his departure from Bombay, which is stated to have been on the 2nd March 1807[4].

The map was never published, but was incorporated into most of the maps of the next thirty years, and for some distant areas it remained the unchallenged authority for even longer.

Northing is known of Reynolds' life after retirement except that he married and settled in a house in Portland Place, London.

RICHARDS, William. Ben. Engrs.
b. *c.* 1745.

Ens. 12–12–64 ... Capt. 1–4–69; Resd. 2–12–76.

Probably the son of William Richards of Cardiff who matriculated at Oriel Coll. Oxon. 21–5–62, aged 17.

Three of his own sons, including Gen. Sir William Richards, K C B. (1778–1861), were in Bengal Army.

Came to India as Art. cadet, but gazetted to Engrs.

[1] D Dn. 66, 23–1–1803. [2] Bo M C. 25–10–1803. [3] Welsh, I (243). [4] C D to Bo. 7–9–89 (10).

11–12–65, Joined Rennell as Asst. Survr.; described as "a very agreable and cheerful companion" [22, 270, 371]; wounded in action against *sanyāsis*, 21–2–66, north of Kurigram [23, 292, 371].

From 1766, Employed on surveys in E. Bengal and Chittagong [13, 22–4, 33, 152, 225]; 1768 to 1771, from Purneah along the north bank of the Ganges to Sāran [21, 27, 33, 225]; 1772, Shahābād, making a plan and report on the fortress at Rohtās [32, 234 269].

Presumably recalled with other surveyors June 1774 [34], and on engr. duties Ft. William 1775.

5–10–76, Applied for leave to Europe; "I beg your permission of leave to proceed on a Voyage to Suez as the means of getting the better of a nervous complaint in my Head, occasionally attended with paralytic symptoms, which I have acquired in this country during a course of upwards of twelve years Service in the Corps of Engineers; but if I should find on my arrival there, that I have received no benefit by the passage, I may then be permitted to resign...& proceed to England.

"As the coasts of the Red Sea between Jedda and Suez are little known to Europeans as well as the navigation thereof; if during the voyage I can be thought of any service therein to future Navigators, I will endeavour to execute any directions you may be pleased to give me" [1].

The Council granted the leave and accepted his offer to survey the Red Sea; "His abilities as a surveyor have been shewn by the large share which he has had in forming the Maps of these Provinces".

Dec. 1776, Left Calcutta, reporting arrival in England the following Oct.; Jan. 1778, on hearing of Rennell's resignation, applied to succeed as S G., and in Nov. the Directors appd. him as such in preference to Thomas Call, who had been nominated by the Council at Calcutta. Never returned to India, and in Jan. 1781 resigned on account of health [260].

Nothing is known of his life in England except that in 1778 he was living at Bath, where Rennell visited him [374].

RIND, James Nathaniel. Ben. Inf. d. 1814.

Ens. 21–5–79 ... Maj. 30–9–1803; Ret. 15–1–1804.

Of Livelands, co. Stirling.

m., possibly 1805, Anne, dau. of Maurice Evans, his eldest son being born July 1806; father of James Nathaniel and William James Rind, both of Ben. Inf.

Lieut. Bom. Mar. 17–8–78. Cadet, Ben. Inf. 10–9–78[2].

"Was a cadet of 1778, before which he was in the Sea line. ... In November 1779, before his appointment of cadet was known in Bengal, he was an officer belonging to the *Royal Charlotte* armed ship". ...

"When the Bengal Armed Ships returned to Calcutta in 1779, I was the officer who remained in charge of the *Royal Charlotte*, moored close to the Bankshall"—he describes a fire on shore, and his energetic attempts to save property;—refused reward from the local Board of Trade, but now petitions Directors to grant some compensation[3].

1785, Asst. to Resdt. at Delhi; 1786, Submitted to S G. map of "The Sick Country and of that of the neighbourhood of Delhi", for which Govt. granted him Rs. 4,000 [42, 233].

1787–90, with 17th Batt. Sepoys; survd. various routes, Etāwah to Aligarh; Kālpi to Nāgpur; Narbada R. to Mirzāpur; also the Ganges from Allahābād to Benares.

18–11–93, Appd. Adj. & Qmr. 1st. Sepoy Bri.; 15–11–94 till Jan. 1801, Bri. Maj. 1st. Bri.; Furl. 4–4–1801 till retirement.

In reporting on Rind's surveys [42], the S G. writes "As it would appear that Mr. Rind has provided himself with every necessary instrument, both for surveying, and for Astronomical Observations, and must also have had a number of people employed, his expence...must have been considerable, and should I think be reimbursed him[4]".

RITCHIE, John[5]. Marine Survr. Bengal. Employed from 1767 till retirement 1786.

B P C. 22–11–86 (14 B), Ritchie states that he had been a Mariner, and that "about the latter end of September, or the beginning of October, 1767, he was employed by the Governor and Council of Bengal as Surveyor to the Marine Department, and...that...his employment...was incessant and exceedingly laborious" [15–7, 21].

24–3–69, Chief & Council of Chittagong reported; "We have furnished Mr. John Ritchie...with...1000 Rupees for the use of the vessels employed on Surveys under his command"[6].

B P C. 23–6–69 "Mr. Ritchie, who was employed in taking surveys to the Eastward, is returned, and submits a Plan of the Sands & Coast from the Island of Sagor to the Eastern Shore" [33, 50][7].

Continued surveying the coasts and Islands, including the Andaman & Nicobar Is. [16, 47, 225], until 1773, and in 1774, Rennell submitted a complete series of Charts of the Bay of Bengal compiled from Ritchie's surveys [17, 153, 224, 269].

1773, Sent on survey to Oudh, and presumably placed under Polier [34]:—

B P C. 22–11–86, "Mr. Hastings sometimes employed him upon Land Surveys, and not unfrequently upon what he called Military Surveys; that in the year 1773, he, the said John Ritchie, being ordered up to the *Province of Oude* upon one of those Surveys, and there being thus no channel of payment...for the allowances of surveyors out of the British Provinces, his salary became greatly in arrears, and upon his return to Calcutta...the new members of the Board of Council, General Clavering, Col. Monson, and Mr. Francis, refused their assent to the payment of his arrears, on account, as it was alleged, of their irregularity. ... The said three members of the Council, who were then a Majority, therefore continued him in his said office of Marine Surveyor, and he has so continued therein to the present time; that his established allowance...from the end of October 1773 to the end of Febry. 1776...has not been paid to him". He further claimed "for Money which he actually expended for Boats from Calcutta to Fyzabad and from thence back to Calcutta"[8]. From this claim it would appear that he was not released from survey in Oudh till the end of 1775; and that his allowance as surveyor was 500 *arcot* rupees a month.

In 1777 Ritchie asked that Govt. would fit out a special expedition for the survey of the Andaman Is. and coast of Aracan, but this proposal was shelved [17][9].

[1] B P C. 28–10–76 (18). [2] cf. J. S. Ewart. [3] Petition from Rind, Misc LR. 7–2–1803. [4] B P C. 11–9–89. [5] Wrongly called James in Dalrymple's list of Charts. [6] *Chittagong Dist. R.* (297). [7] B P C. 23–6–69. [8] B P C. 22–11–86. [9] I O Copies. 40–1777 (41–3). 2–1–77.

B P C. 5–12–86, Applied for leave to England, "The condition of my health being such as requires an immediate change of climate; ... after a series of 19 years continuous service in the office of Marine Surveyor, I hope there is no impropriety in my requesting the favor, also...to continue my allowance to me. ...

"It is a small salary, and the receipt of it has been the only advantage I have ever reaped from the Company's Service, and because my Line of Service, from its singularity, has had no gradation of advancement, ... whilst its Duties have been uncommonly severe, uncommonly hazardous, and equally unprofitable; for what advantage could be obtained from tracking a Labyrinth of Woods and Rivers? Or from exploring the Shoals of a shelving and broken Sea Coast? All of which uninhabited, and seldom visited, except perhaps in the disastrous case of shipwreck.

"In the meantime it has been from my Labours, that the Hon'ble Company have obtained all authentic knowledge of the Sea Coast and Tide Rivers of their possessions in Bengal, together with other services more immediately important and beneficial" [45, 101, 204].

Arrd. England Sept. 1787, and apparently never returned to India, though he applied to do so in March 1791.

Not to be confused with a John Ritchie, "Surveyor of Cargoes", who was allowed a pension of £ 40, from April 1790, C M. 28–4–90.

ROBERTSON, Alexander. Mad. Inf.
b. 1762. d. 4–4–1825.

Ens. 12–5–79 ... Lt Col. 20–8–1805. Ret. 28–2–1809

1781–2, Explored roads round Nellore [100].

Survd. Dindigul Dist., date unkn.; map 2½ miles to an inch, "with Table of Bearings & Distances"[1].

ROBERTSON[2], Thomas, Ben. Engrs.
b. 1762–3. d. 18–6–1831, Calcutta; M I. S. Park St. Cem.

Ens. 17–7–82 ... Col. 5–6–1829.

m., 1st., Edinburgh, a dau. of Wm. Hamilton; she d. at sea, July 1807. m., 2nd., a lady who d. at Selkirk Manse, 18–11–1822.

Country Cadet of 1781.

Probably employed on survey of Calcutta under Mark Wood, as in May 1785 it was ruled that he and Wood were not entitled to draw survey allowances, being Engrs. [5, 52–3, 270, 277][3].

July 1787, Asst. Engr. at Cawnpore. March 1793, on duty under C E. Ft. William. B G O. 13–3–94, "now on duty at Chittagong, is appointed Engineer to Lt Col. Erskine's Detachment", and employed on survey of the southern frontier of the province [59].

G O. 5–12–96, Furl. to Europe for 3 years, returning 12–12–1800.

1802–4, on survey of eastern Sundarbans.

ROBINSON, Edward. Ben. Engrs.
d. Nov. 1781, Bhāgalpur, of dropsy; M I.

Ens. 23–10–73 ... Capt. 29–1–81.

1780, Survey of Budge Budge and Hooghly R. [54], and probably on survey of Calcutta as referred to in B P C. 5–4–84 [52]; Thos. Robertson [*sup.*] was then an ensign.

1781, on survey with Maj. Popham's dett., Gwalior [324, 325][4].

ROSE, Alexander. Ben. Inf.
b. *c.* 1737. d. 17–10–69, Calcutta.

Ens. H M.'s 54th/52nd Foot. 1–1–56; Arrd. India Sept. 1768; tr. as Capt. under B M C. 1–9–68.

Surveys in Muzaffarpur & Sāran [29 n. 4][5].

ROSS, Patrick. Mad. Engrs.
b. *c.* 1740. d. 24–8–1804.

Ens. H M.'s Engrs. 19–5–58; Principal Engr. & Lt Col. Mad. 15–9–70; C E.; Furl. 1778–82 and 1793–7; Maj Gen. before 1799; Ret. 1–1–1803.

2nd son of Patrick Ross of Invernethy & Susanna Douglas his wife, of Strathenrie, co. Fife.

m., Madras, 25–12–77, Mary Clara Maule, sister to George Maule, Mad. Engrs.; left a son Robert Charles Ross (1783–1816), Mad. Civ.

M P. Horsham, 1802. *D N B.; D I B.*

Sent out in 1770 to succeed John Call as C E. [322] ... Responsible for all surveys carried out by Engr. officers; see especially his instructions for survey of Northern Circārs, 1773 [92, 169, 203].

See also account of Dugood's ctml. 1775, one charge being Dugood's alleged defamation of Ross's professional attainments [335].

1783, Recommended the appt. of a Surveyor General at Ft. St. George, and the est. of a corps of surveyors [263].

Responsible as C E. for custody of maps and surveys and for the compilation of general maps [239, 251, 256–7]. His official letter-books are preserved at the India Office [24 n. 9][6].

1791–2, 3rd. Mysore War [173 n. 3].

1798–9, C E. at Presidency during 4th Mysore War, whilst Gent [244 n. 4] was C E. with Grand Army [312]; sd. C E., Maj Gen., at Madras, April 1800.

RUSSELL, Claud. Mad. Civ.
bapt. 8–10–32. d. 17–4–1820.

Writer, Ben. Civ. 1752; tr. to Mad. C M. 24–4–71.

3rd. son of John Russell of Braidshaw, by his 2nd. wife, Mary.

m., Madras, 17–10–77, Leonora, natural dau. of George, 1st. Baron Pigot [143 n. 8].

1776, Nomination as Resdt. Tanjore started the dispute between Pigot and Council [256 n. 6, 330][7].

24–7–82, Appd. Chief at Vizagapatam; Oct. 1782, helped Pearse in obsns. for long. [155].

Recorded routes to Jeypore & Bhadrachalam[8], both of which journeys must in those days have been charged with adventure[9].

RUSSELL, George. Ben. Inf.
b. 1742–3. d. 6–12–1827.

Ens. 29–1–67; Resd. 30–12–74; Re-admitted 20–2–83; Furl. 21–12–1803; Lt Gen. 4–6–1813.

One of his daus. m., Calcutta, 1819, Sir David Elliott K C S I., Mad. Civ.

8–4–67, on survey in Rāmgarh in company with Carter [26, 270, 326].

1767–71, Survd. "the country between the Soane and the Caramnassa Rivers, as also the Roads from Patna to Daoudnagur, & from Patna to Moneah, and

[1] D Dn. 246 (55). [2] Frequently *Robinson*. [3] Sec. Dept. of Inspection, 12–5–85; cf Robert Kyd. B P C. 5–4–84. [4] *India Gazette*, 28–11–81. [5] Orme MSS. 65 (48) & 134. [6] Mack MSS. LXVIII–IX. [7] Carmichael (220). [8] 65 J–9; 66 C–14. [9] *Memoir*, 1793 (244).

the course of the Soane below Daoudnagur", which would approximately correspond to the present Shahābād Dist. [33, 225][1].

1771–4, Supt. of Works at Berhampore.

1778–9, William Hickey records a visit to "Salt Hill; ... found some of the party up, engaged at hazard, to which several were greatly addicted, especially Major George Russell, who about four years ago, had returned from Bengal with a fortune of upwards of forty thousand pounds, the whole of which he had squandered away or lost at the gaming table, he at the period I became acquainted with him not having five hundred pounds left"[2].

To recoup his losses Russell had to return to Bengal, and Hickey narrates that "the arrival of the little *Hannibal* was announced. This was an English fifty gun ship taken by Mr. Suffren on his way to India [321]. On board this ship at the time of her being captured was my London friend, Major George Russell. ... Whilst laying at St. Helena, the *Hannibal* touched there, and, Major Russell being intimate with her commander, he offered to take him on to Madras. ... The Major, therefore, removed to the *Hannibal*, which off the Cape unluckily fell in with Suffren's squadron and was taken. ... While upon the voyage he fell in with a Danish Indiaman bound to Tranquebar, and Major Russell, obtaining the French Captain's leave, after giving his parole not to serve until exchanged, went on board the Dane"[3].

Hickey writes later, "On the 31st August [1789] I left town to spend a few days, as I frequently did, with my friend Major George Russell at Barrackpore. ... Major Russell, although he had attained the rank of a field officer, knew nothing of military tactics, never having done a day's duty or relieved a guard. He had acquired a very handsome fortune by building the Barrackpore [Berhampore ?] barracks and other public edifices, which, as already observed, he squandered away at the gaming table in England, and then returned to India to endeavour to acquire a second competence. ..." Then follows a story of Russell being left as senior officer commanding the troops and getting through his parades with the help of the adjutant[4].

SARTORIUS, John Conrad. Bom. Engrs.
b. *c.* 1740. d. 10–12–1801, Cannanore; M I.

Lieut. 21–7–75 ... Col. 1–1–98.

His will mentions relatives in Germany.

m., Bombay, Annabella Eliza, dau. of Mr. G. E. Rose; father of Adm. Sir George Rose Sartorius, G C B. (*D N B.*).

1783–4, C E. at defence of Mangalore. 1785, to survey Salsette I. [120, 147]. 1786, Engr., Survr., and O C. Troops, with expn. to Chagos I. (123).

Dec. 1790, with Frederick's dett. at siege of Dhārwār, taking over comd. on Frederick's death, March 1791; led dett. back to Bombay via Poona [128, 187].

From 1792, Charge of defence works and survey of frontiers, Malabar, till death; commd. the Engrs., and submitted maps of the province [131–2].

C E. Bom. Army during the 4th Mysore War, 1799, and present at capture of Seringapatam [118, 312].

SCHLEGEL, Charles Augustus (Carl Christian August). Corps of Hanoverians [99 n. 4].
b. at end of 1761, Hanover; d. 9–9–89, Madras.

Ens. 13–8–81; Lieut. 13–1–89.

Son of Johann Adolf Schlegel, preacher, schoolmaster, and poet, and his wife, dau. of the Mathematician, Hubsch. Bro. to August Wilhelm von Schlegel (1767–1845), Sanscrit scholar, and translator into German of 17 plays of Shakespeare, who assumed the *von* in 1814 (*D I B*).

1778, Lance-Corporal in the Regt. of Linsingen (10th Inf. Regt.).

The British army being engaged in the American War of Independence, King George III placed the 15th & 16th Regts. of Hanoverian Electoral troops at the disposal of the E I C. for the war against Haidar Ali [4, 40, 99 n. 4].

Arrd. Madras, Oct. 1782, as Adj. 16th Regt., which become the 14th. from 1785.

1788, Completed a striking map of the Carnatic now preserved at B M., which reveals him as a good surveyor and no mean geographer [99, 169, 185, 243]; he also wrote a book on the military geography of the Carnatic at the desire of the Governor.

After the arrival of re-inforcements to the Hanoverian Corps in 1787, he became involved in quarrels with the new officers, wrote a scurrilous poem, and was accused of other breaches of discipline. Whilst the latter accusations were not proved, he was convicted by ctml. on the count of the offensive poem, but the period of arrest already served was considered sufficient punishment. The court took notice of his voluntary labour on the map, commending "dessen Dienstfahigkeit, Einsicht und nachahmenswurdige Application"[5].

SC(H)OULER, Robert. Mad. Inf.
d. 22–6–89.

Ens. 26–10–68 ... Capt. 16–7–79.

m., Madras, 11–9–83, Miss Elizabeth Bellew; Father of James Brathwaite Scouler (1784–1812) Mad. Inf.

1777, on detail survey of roads of Madras Town [94].

SCOTT, Andrew. Mad. Civ.
b. 1752–3. d. 21–1–1825, Ft. St. George; M I.

Writer 1773 ... Senior Merch., Masulipatam 1790.

1774, Appd. to survey lands of Masulipatam [143], and survd. Nizāmpatnam in that dist. [110].

SCOTT, Samuel. Mad. Engrs.
d. 20–8–73, Vallam[6].

Ens. 12–2–73.

M P C. 19–2–73, "well qualified to answer Mr. Barnard's purpose, ... appointed to assist him" in finishing the maps of the *Jāgīr* [142].

SHAW, James. Mariner.

Master Attendant at Chittagong.

B P C. 9–1–64, in the marine service at Chittagong, "to be employed in sounding & surveying the Coast & River, conducting Vessels out or in, etc." [14–5].

SHOWERS, Samuel Howe. Ben. Inf.
b. 1745, New England. d. 12–10–1827.

Ens. 27–12–64 ... Lt Col. 28–5–86; Dismd. 1–9–93.

m. 1st, Calcutta, Miss Ann Hammond, who d. 4–5–78, Patna, aged 25.

m. 2nd, Calcutta, 13–11–79, Melian, widow of William Dare of Ben. Inf. who had been drowned at sea; she d. 1–1–1834, aged 87.

Father of Charles Lionel & Howe Daniel Showers, both of Ben. Inf., besides 4 other sons.

Sailed for India 20–2–64; Posted to 1st Eur. Regt. 13–8–65.

[1] I O Maps. I. A C. 13. [2] Hickey, II (315–6). [3] ib. III (62–3), cf. John Byres. [4] ib. III 350–1). [5] Hanover State Archives. Report 5237 (38) of 23–12–1938. [6] 58 N/2.

1766–9, Employed constantly on surveys by Col. Richard Smith, O C. 2nd. Bri. on the western frontier [24, 29, 223]. 1768, on mission to Rāja of Nāgpur; survd. road from Allahābād [295–6]. Many of his maps are preserved, all beautifully drawn; there are also records of astr. obsns. for lat. at Lucknow and elsewhere [226 n. 6][1]. No record of surveys later than 1769.

Furl. 1788 till 1790; on return to Calcutta, whilst on half-pay as supernumerary Lt Col., waiting for a vacancy, he became the central figure at a ctml. that created a great stir. Suspected by Lieut. O'Halloran of misconduct with Mrs. O'Halloran, he was brought to ctml. on a charge of disgraceful conduct in refusing to meet O'H's challenge to a duel. The trial lasted from Jan. 15th to Feb. 15th 1791, and in spite of his apparently reasonable defence that letters had gone astray, the Court found Showers guilty, and ordered his discharge from the service [309, 344]. Two weeks later O'Halloran completely withdrew his charges;

"The reluctance *I imagined* he shewed to acquiesce in my desire of a personal interview, arose from a *different motive* than that which I attributed to him—it arose from an earnest desire to exonerate Mrs. O'Halloran of the most distant shadow of guilt before he gratified my wish. I have dropped the action I commenced against him in the Supreme Court of Judicature. ... *I am alone deserving of censure for my precipitation.*

On the orders of the Directors, O'Halloran was tried by ctml. for defamation of character, and was found *not guilty*, "it appearing to the Court that he had sufficient apparent cause to warrant the accusations he preferred" [of refusing to meet a challenge][2].

The sentence of the ctml. on Showers was confirmed by the Directors[3], and in spite of many petitions, they steadfastly refused to re-instate him.

Melian Showers, his wife, warmly supported him throughout this trouble, having been soon convinced of his innocence, and did her best to prevent any duel by getting a warrant out for the arrest of O'Halloran. It was on her application to the Directors that Showers obtained a copy of the proceedings of the ctml. which he pub. in 1796, together with O'H's letter of retraction[4].

C M. 2–6–95, Showers was granted an annuity of £ 180 from the Contingent Fund.

It is said that the marriage with Melian Dare had been "arranged" by Marian Hastings, and that "it was a miserable marriage, for Showers was a violent man from whom she separated after 'shocking recriminations' and scenes in public", also that Showers refused her any share in his pension "since she left him of her own accord"[5]. There is no indication of such trouble in the records of the ctml.

SMITH, The Rev. Willliam.
"Outside the Service".

Has not been identified, though there were many of his name in Holy Orders who might fit[6]. He would probably have been under 30 years of age at the time of his survey.

Bo to C D. 28–2–77 (37); "Came to Bengal as private Tutor to a young Gentleman there" [154].

July 1775, Col. Monson [31 n. 1] proposed that he should be appd. survr. with Upton's mission to Poona [30–1], and Smith records that "as I was not particularly employed in the duties of my function, the Superior Council were also pleased to honour me with an appointment and the necessary instructions".

He discusses the prospect of discovering new and valuable products, particularly of medical value, in the country they were to pass through; "One such secret would undoubtedly be a handsome fortune to a European of the faculty; I had accordingly proposed to make these several enquiries. ... I was favoured with other Instructions, which were delivered with so much necessary precaution, to avoid any suspicion in people so jealous of Europeans, and who might thereby cause difficulties and obstacles to be thrown in the way: and the nature of the journey was altogether such, that it afforded but few means and opportunities of making these enquiries, and I was obliged to relinquish all thoughts of carrying them into execution"[7].

On the march from Kālpi to Poona, Oct.–Dec., Smith kept up a continuous survey, taking regular obsns. for lat. and long., and continued down to Bombay the following month. [2, 31, 154, 176, 185, 200, 268] His survey was the first continuous line measured across the centre of India, and was a notable achievement.

His journal contained "55 large Folio pages closely written, & of these one half are figures & Astronomical Observations"[8].

From Poona he submitted a paper on the determination of longitude, with a claim on the "Board of Longitude" at the Admiralty for the offered reward [151, 154]. "Soon after my arrival at Poorunder[9], I began to work up the Observations conformable to the Method I had proposed; ...it became necessary to settle the theory previous to that work, which has cost me abundantly more trouble then I had first apprehended. ... I have at length succeeded beyond my expectations, and improved much on the plan I had first adopted. Just before the rough copy was finished, I received...the Accompanying Abstract of an Act of Parliament, which gives me some hope of a gratuity for the performance; I should therefore rather chuse to decline my former intention of it's appearing in our Philosophical transactions[10], as mentioned to you on a former occasion, and wish to have it communicated to the Honble Commissioners for the discovery of the Longitude at Sea, with a view of its being put on due trial, and claiming a Competition for the reward"[11].

The paper was referred to the Astronomer Royal who "reported that...he finds that the same is not new, and that it is not practicable at sea with sufficient exactness"[12].

From Poona he visited Bombay and obsd. the long. there, and on other occasions he obsd. the long. at Cochin and Calcutta [154, 179].

[1] B M Addl MSS. 15739 & Orme MSS. 65 & 334. [2] *Calcutta Mag. V* (July-Dec. 1793). [3] C D to B. 1–3–93 (24) & B S & M C. 9–9–93. [4] *The Proceedings at Large on the Trial of S H. Showers Esq., ...; I O Tract.* 23. The story of the ctml. by Hickey, IV (21–2) is much distorted. [5] Grier (315–6); Murray (265). [6] eg. Rev. Wm. Smith, Curate, Thorney Abbey, nr. Peterborough, wrote to R S. 11–2–67; B M Addl MSS. 28542. [7] Journal, B M Addl MSS. 29213. [8] Misc. L R. 89 (207). [9] 20 m. S E of Poona. [10] Though not on records of R S. this suggests that Smith was, or wished to be, a F R S., and suggests identity with the curate of Thorney Abbey [*sup*]. [11] Letter to Col. Monson, B P C. 23–12–75. [12] Board of Long. Progs., 22–11–77 & 7–3–78.

It was over a year before he submitted any results of his survey, and he writes to the G G in C., "Poonah, Sept. 14th 1776. ... I have been much concerned and grow uneasy at not being able to transmit to you the Particulars, ...and though you specified no limited Time, and seemed not to expect them before my Return to Calcutta, yet I confess our long stay here ought to have been productive of something in that way. ... But the progress of my work has gone on much more slowly than I had apprehended. ... I hope soon to present Colonel Upton with a Copy of my Journal"[1].

He eventually travelled back by Balasore[2], and wrote to the Council again "Calcutta, 25–8–77; The ill state of health which Providence has been pleased to afflict me with, laid me under the disagreable necessity of leaving Col. Upton at Poonah, and going to Bombay for Assistance, which prevented my returning with him; and also from completing my journal. ... A map of the tract now only remains to complete it agreable to my wish; ...but since... a more favourable opportunity of complying with the advice of the Doctors in going to England cannot occur, I...entreat your permission...to lay my journal before the Hon'ble Board as it is; [I] promise to finish the map, if it please God, and send it at the first opportunity. ... I also beg leave to return my sincerest thanks...for the appointment you were pleased to honor me with...," viz. Surveyor to the mission[3].

After selling his quadrant to Pearse [200], he sailed from Calcutta in the *Egmont* taking home on behalf of a friend "2 bags, the first containing 1000 Pagodas and 218 Zukeens or Venetians, the second containing 1100 Pagodas—in all 2100 Pagodas and 218 Zukeens—which I hope will sell for about £ 1000 sterling. The Pagodas are better than those generally sent from Madras—for example, the Madras Pagoda passes for 3 Rs. 8 annas [278 n. 7], and the Hyderabad Pagodas, being those I have now sent, pass for Rs. 3 As. 14, and very often Rs. 4, as they are heavier and much better gold"[4].

He wrote again, "Cape of Good Hope. 29–1–78. ... The hypochondriac complaint, which laid me under the necessity of returning home, and being also seized with a fever on my way to Madras, prevented me from sending you the plan of the tract to Poonah... for the completion of my journal. ... I thank God I am much recovered, and during my stay here have done the best my health and time would permit to finish that plan; indeed the places of resting each day are accurately laid down; but in other respects, I was not able to pay the attention I wished; and very much regret the necessity of omitting most of the hills, mountains, and every embellishment, as well as ornament, I had intended; it is however, intelligible, and by the help of which and my journal, another person may draw a more accurate and complete one"[5].

The *Egmont* called at St. Helena with Smith on board and sailed for England 8–3–78, but it was not until 1–1–79 that he handed in his map to the Directors[6].

Whilst at Poona Smith had asked the Bombay Govt. to appt. him Chaplain at Surat, which was recommended to the Directors, "as this gentleman bears a general good character, and from his astronomical knowledge and other qualifications may prove exceedingly useful"[7]. The Directors approved, but after arrival in England Smith decided not to take up the appt.[8].

Nothing further is known of his later life in England; there are several Wm. Smith's who were appd. to livings in England about this time, one of whom, appd. Rector of West Kirby in Cheshire 1780, d. 1787.

St. PAUL[9], Jean-Baptiste. French Inf.
b. 1729, Mézières, France.
d. 7–4–92, Pondicherry.

Sept. 1768, Capitaine des grenadiers au Batt. de l'Inde; Lt Colonel *c.* 1783.

m., Mademoiselle Francoise Quentin de la Metrie, of Madras; his eldest son, Francois Jean Antoine, b. Pondicherry 23–10–66, d. 24–6–1822.

Chevalier de l'Ordre royal et militaire de St. Louis.

1750, Attd. to the bri. of Germans with Bussy to Hyderābād and Aurangābād and, according to Duperron, survd. and mapped the marches [115].

STEVENS, William. Mad. Engrs.
Killed in action, Pondicherry, 14–10–78.

Ens. 7–1–64 ... Maj. 11–3–74.

Son of Mrs. Ann Stevens, who was granted a pension from Lord Clive's fund, 21–5–83; d. unm.

July 1764, at siege of Madura.

1765, deputed to search for a navigable channel through Adam's Bridge and Palk Strait; spent several weeks during Feb. and March on survey without success [87].

June 1765, at capture of "Beam Naique's Pollam" from Tripasur[10] and employed "to open the woods and destroy the strongholds...of Trivallore"[11].

From Nov, 1765, Engr. at Masulipatam, employed on fortifications and works. Submitted plan of fort at Kondapalli [112 n. 8] and country round, referring to "Mons. Bussy's Chart [115]"; also "a small scale sketch showing country from Masulipatam to Kondapilly along Kistna, and along Coast northwards to Sittiavaram [92]"[12], 8–9–66, Report on works required for defence of Vizagapatam.

Board record that "Mr. Stevens is the only Engineer who is not on the Civil List, and is a most deserving young man, and a great acquisition to that Corps", and the following month they report; "We cannot avoid mentioning the particular Merit of Mr. Wm. Stevens; ... He is a very great acquisition to that Corps, and, indeed, such are his Capacity and assiduity that we can venture to assure your Honors so promising a servant is very seldom to be met with [154]"[13].

1772, Survd. Coringa Bay as a possible shelter for the Company's ships [101, 103].

Continued to be employed on Engr. works and occasional surveys at Masulipatam, till in 1773 ordered on survey of the southern Circārs [3, 92–3, 110,]; a few weeks later "ordered to repair to the

[1] B P C. 23–12–76. [2] ib. 25–2–93, Map 16, "Padree Smith's route from Poonah to Ballasore". [3] ib. 25–8–77. [4] Macpherson (318); this book contains a reproduction of Smith's map. [5] B P C. 5–10–78. [6] C M. 1–1–79. [7] Bo to C D. 28–2–77. [8] C M. 15–1–79. [9] Sometimes "de St. Paul". [10] 66 C/4. [11] Tiruvallur, 57 O/16; M S. & Pol. 24–8–65. [12] 65 K/11; M M C, N. Circārs, 4–4–66. [13] M to C D., 22–1–67 (111).

Presidency for the Reduction of Tanjore" [93][1]. After the capture of Tanjore, appd. to charge of the works at that place and survd. its neighbourhood [95, 203].

1778, Acting C E. in the absence of Ross [382], and Oct. 14th killed at the siege of Pondicherry. "He had conducted the two different attacks on the Fort with uncommon exertion, and fell only two days before the Surrender. He was a man of great ability in his profession, and possessed such integrity and zeal, as rendered him a most valuable servant of the Company"[2].

Gen. Hector Munro reported 25–10–78, "Major Stevens, the C E., went immediately to repair the gallery, and on his return...he was unfortunately wounded by a cannon ball and died that evening. In him Society have lost an honest man & the Company a most gallant soldier"[3].

"There was at Pottanur, on the high road 4 miles west of Pondicherry, close to the French Frontier, a monument to his memory, erected by Maj Gen. Sir Hector Munro."[4].

In a letter to the Directors, 13–3–79, the Madras Council wrote, "Maj. Wm. Stevens...this diligent & faithful servant, tho' employed in situations which have been supposed extremely lucrative to others, has died worth no more than £ 800, & his family at home are likely to be distressed by the loss of the little support that he was able to afford them while living.

"The character of Major Stevens and his long and faithfull services to the Company, plead strongly in favor of those relations who were so poor".

Rennell acknowledged the use of many surveys by Stevens [271]; the coast of Palk Strait from Negapatam to Tondi; Masulipatam to Coringa Bay; Yanam[5] to Masulipatam and a survey of Kistna R. from Bazwāda to the sea[6].

Took astr. obsns. in company with Pringle [169, 170], who sometimes wrongly calls him Stevenson; there had been a William Stevenson in the Mad. Engrs., Ens. 1757, but he died 1765, and there is no record of his having been employed on surveys.

STEWART, Charles. Bom. Civ.
b. June 1748. d. 1783, unm.; poisoned whilst prisoner in Mysore[7].

Son of James Stewart, Sheriff, co. Kinross.

Jan. 1779, after disaster of Vadgaon, Surrendered with Wm. Farmer as hostage to Marāthas; kept up survey of marches [121] till released at Goddard's camp near Baroda 9–3–80[8].

2–12–82, Appd. Paymaster & Commissary to Force proceeding to Malabar Coast under Mathews [125]; taken prisoner at Bednur April 1783.

STEWART, Duncan. Ben. Inf.
b. 1756 in Scotland.
d. 15–1–84, in camp at "Kohaary Nullah" [345].

Ens. 7–8–76; Lieut. 24–7–78.
E I M C. III. 450.

18–2–72, Left England as midshipman in *Duke of Albany*, East Indiaman; wrecked on Sandheads at mouth of Hooghly R., July 1772.

1772, A D C. to Sir Archibald Campbell [101 n. 9]. Appd. Inf. cadet, and Asst. Engr.

1774–5, with 17th Batt. Sepoys, Midnapore Dist.; 1776, Ens. 10th Batt. Sepoys.

March 1779, Appd. Survr. to Goddard's Dett., having already survd. route of the march from Burhānpur to Surat [4, 39, 155].

A paper found amongst his effects, and accepted as a will, appd. William Stewart of Hollsode, near Lochmaben, as executor in Europe. Left annuity to his mother, and to his cousin Mrs. Watson, and mentioned an uncle Mr. Campbell.

STEWART, Patrick[9]. Ben. Engrs. Killed in action, 6–2–92, Seringapatam.

Ens. 30–9–81; Lieut. 1–11–82.

Son of William Stewart, of Loinmaristock, Lord Provost of Perth, and Christian his wife.

d. unm.; name on cenotaph at Bangalore.

1781, in campaign against Chet Singh of Benares [35 n. 8].

1–8–87 Appd. Dman. in S G.'s office, resd. March 1789 [236, 271, 277].

On Engr. duties Ft. William till ordered on military service to Mysore, 15–8–91.

Left 1000 current rupees to Mark Wood "as a small Testimony of my regard for him", and also Rs. 500 to Thomas Wood, of Engrs[10].

STEWART, William. Ben. Inf.
bapt. 10–6–63. d. 14–9–95, Hyderābād.

Lieut. 2–9–81.

Son of James Steuart, writer in Edinburgh, and Alison his wife.

d. unm., leaving 4 natural children.

Sailed in *Neptune* 3–6–80, aged 17; tr. as Pract. Engr. to Mad. Est. May 1781, but did not join.

Survd. road between Agra and Delhi[11], possibly after joining escort to Resdt. with Sindhia in July 1787.

1790, Appd. Asst. Resdt. Hyderābād, and survd. route from Agra through Gwalior and Aurangābād to Pāngal where he joined the Nizām's camp, 5–7–90 [56]. Leaving Pāngal 12–2–91 with Nizām's troops, survd. route to Bangalore to join the Grand Army [116]. After close of the war made surveys round Bangalore, and through Cuddapah to Pāngal [113][12].

Continued as Asst. Resdt. at Hyderābād till death.

In his will, appd. his bro. Thomas Ruddiman Steuart, physician, and Charles Steuart, writer to the Sygnet, Edinburgh, to be executors, still maintaining the form "Stewart" for his own name.

STOKOE, Joseph Hind. Ben. Engrs.
d. 12–1–1801, Penang.

Ens. 20–7–82 ... Bt. Capt. 8–1–98.

1779, Signed, probably as compiler or dman. only, a reduced map of Goddard's march Kālpi to Surat [122 n. 2]. Asst. Engr. to Col. Morgan's Dett., and under G O. of 1–11–83 appd. A Q M G to Ben. Dett. on return march from Bombay.

B M C. 14–1–90, on "Survey of the old Powder Mills, Pultah Factory & Fort Gloucester".

STUART, Alexander. Ben.

B P C. 12–1–67, "Mr. Stewart", Asst. Survr. under Plaisted on survey of Channel Creek, drawing Rs. 250 a month 283 [Identity uncertain].

B P C. 15–8–68, withdrawn from survey of Calcutta Lands on account of unsatisfactory work [137].

[1] M M C. 15–7–73. [2] M to C D. 22–10–78. [3] B S C C. 30–11–78. [4] Cotton (157). [5] French settlement, 5 sq. m., 65 L/1. [6] *Memoir*, 1793, *passim*. [7] *Late War in India*, I (201). [8] ib. (105). [9] Also known as Peter. [10] Ben. Wills. 1791–2. [11] *Memoir*, 1793 (68 n). [12] Bo S & Pol. 23–11–92.

SUL(L)IVAN, John. Mad. Civ.
b. 5–4–48. d. 31–10–1839.

Writer, 1771 ... Sen. Merch. 1774; Resd. 15–2–85.
Son of Benjamin Sullivan of Cork.
m., 23–5–89, Lady Henrietta Anne Barbara Hobart, dau. of George, Earl of Bucks.
Burke's *Peerage*.
From 1774, Member of Council at Masulipatam, where Sterne's Eliza Draper stayed with him[1]. Author of *Observations respecting the Circār of Masulipatam*.
21–12–81, Appd. Resdt. Tanjore; assisted organzation of Fullarton's army [98]. Sent Rennell map of south India, authorship unstated [243].
Settled at Riching's Park, Bucks; 1801–5, Under-Sec. at War.

SYDENHAM, Benjamin. Mad. Engrs.
bapt. 24–9–77, Madras.
d. 15–3–1828, Bruges. unm.

Ens. 12–9–94 ... Capt. 1–1–1806; Resd. 13–7–1808.
Eldest son of Maj Gen. Wm. Sydenham, Mad. Art. and Amelia his wife; minor cadet 1789; ed. Harrow 1789–93.
Bro. to George and Thomas [*inf*], both of Mad. Inf.
History of the Sydenham Family, G. F. Sydenham. 1928.
29–12–95, Ordered to join Mackenzie at Rāmnād for expn. to Colombo [117, 350][2].
1797–8, Adj. of Engrs. at Madras.

1798, Appd. Asst. to Mackenzie, Engr. & Surveyor to the Nizām's Dett.; April, Survey from Ellore to Hyderābād; astr. obsns. at Hyderābād [175].

22–10–98, Present at disarming of French force. Left Hyderābād with English Dett. 13–12–98, making survey of march & reaching Āmbūr 21–2–99, after visit to Madras [118, 203][3].

After resignation become Comnr. of Excise.

SYDENHAM, Thomas. Mad. Inf.
bapt. 3–3–80, at Madras.
d. 28–8–1816, Geneva.

Lieut. 5–12–94; Capt. 26–3–1802; Resd. 4–5–1810.
2nd. son of Wm. & Amelia Sydenham, and bro. of Benjamin [*sup*]; ed. at Harrow; minor cadet Jan. 1789.
m., St. George's Hanover Sq., 19–12–1803, Mrs. Frances Bunbury, who d., Hyderābād, 23–10–1807.
D I B.; *G M.* 1816, II (374); *As J.* 1816, II.

27–1–99, as Lieut. of Guides during 4th Mysore War, sent to meet Nizām's Dett. on its arrival from Hyderābād to conduct it into Ambūr [118]. Succeeded to comd. of Guides after fall of Seringapatam [111].

In July sent to Seringapatam to collect information regarding new boundary of Mysore and, after waiting a month for instruments, commenced survey of that boundary between Gazalhatti and Punganuru[4]. Measured a 3-mile base, but astr. obsns. were interrupted by boisterous weather, and not completed. Then "a violent attack of the fever and ague, a distemper common in the districts, obliged me to repair to Seringapatam for the benefit of medical assistance. It was with unfeigned regret that I felt my precarious state of health, the natural consequence of so violent an attack, would oblige me to relinquish...a work which I had undertaken with so much pleasure [118, 194]". He abandoned the survey, went down to Madras, and was appd. Persian Translator, 29–10–99.

31–5–1800, Appd. Secretary to the Resdt. at Hyderābād. 1802, Resd. owing to ill-health, and returned to England, where he went into residence at Christ Church, Oxford.
Returning to India 1804, became Resdt. at Poona, and then at Hyderābād. Resd. 1810, and returned once more to England, where he did distinguished work in the Diplomatic Service, becoming Envoy Extraordinary to Lisbon 26–5–1814.

TAVERNIER, Baron d'Aubonne Jean-Baptiste. French Merch. & Traveller.
b. 1605, Paris. d. 1686, Moscow.

Son of a dealer in maps and charts, who had settled in France from Antwerp.
m. 1662, at Paris.
Is said to have sold goods and diamonds to the value of 3 million francs to Louis XIV, who ennobled him in 1669. Bought the barony of Aubonne in Switzerland, but had to sell it later to clear his debts.
On the revocation of the Edict of Nantes, 1785, moved to Switzerland, and then to Berlin.
Dict. Générale; La Grande Encyclopédie; Ball.

Made several expeditions from one end of India to another. No scientist, but kept detailed accounts of his journeys, particulars of which, especially distances in *coss*, helped early geographers to work out the relative positions of places visited [10, 13 n. 13, 78, 118, 233].

An account of his six voyages to India was published in Paris in 1676, and an English translation by Ball in 1889[5].

1st.—1631, to Persia, returning to Europe 1632.

2nd.—1638, to Persia, to Dacca 1640, Agra 1640–1, Surat 1641, Ahmedābād; sailed for Europe 1642.

3rd.—1643, to Persia, to Surat 1645, Golconda[6], Kistna, Vengurla[7], Goa; then to Java whence he sailed for Holland 1649.

4th.—Left Paris 1651, to Masulipatam July 1752, Madras, Golconda, Surat, Ahmedābād, sailing for Europe 1654.

5th.—Left Paris 1657, Isfahān till 1659, Masulipatam May 1659, Surat 1660, Sholapur[8]. Returned Paris 1662, and married.

6th.—Left Paris 1663, Persia till 1665, Surat, Gwalior, Agra; visited "Great Mogul" at Delhi, Jahanābād[9], Patna, Dacca. Left Surat 1667 for Isfahān; Paris 1668.

In the account of his own journey from Basra to Aleppo, Plaisted [363] writes scornfully of the accuracy of these records; "Tavernier...has so far deviated from the true State of Things in crossing the Desert, that was I not aware his Voyages were collected after he had done travelling (mostly from his memory); I should have been suspicious that many things, delivered as his, had been the produce of some of those Chamber Geographers"[10].

[1] Wright. [2] Mack. MSS. lxix. [3] Journal, M R I O. M 83. [4] 58 E/2 & 57 K/11. [5] Index to travels, Orme MSS. 240 (1–83). [6] 5 m. W. of Hyderābād, 56 K/7. [7] 48 E/9. [8] 47 O/14. [9] One of the ancient cities of Delhi. [10] Plaisted (Preface).

TERRANNEAU, Etienne-Charles Cossard[1] de. Ben. Art.
d. 1765, in India ; hanged himself.

Lieut. 1756 ; Capt. Lieut.
m., 2nd. Anne ———.

March 1757, a French officer of Art., serving in Chandernagore during siege [311]; quarrelled with the Governor and deserted to the British March 9th. Clive wrote to Adm. Watson, 18–3–57 ; "The only artillery officer at Charnagore is come over to us ; he gives a very favourable account of matters"[2] ; given a comn. in the Company's Artillery [266].

"Had served with credit in the south of India, and had lost an arm in his countries service"[3].

"Bore the recollection of his treachery very well for at least eight years, rising to the rank of Capt. Lieutenant in the Company's Artillery, and at last hanged himself owing to the misconduct of his wife"[4].

His map, already described [221–2], was undated, and was apparently compiled from his own obsns. and such information and maps as he collected during military service up-country. He probably served during the campaign round Patna, 1760–1, and in his will of Sept. 1763[5] notes that he was "now ordered on an expedition against Cossim Ally Cawn [24, 345]".

TIEFFENTHALER[6], Father Joseph. S J.
b. 24–7–1710. d. 5–7–85, Lucknow.

Born at Bolzana[7] in the Austrian Tyrol ; S J. 9–10–29.

Left Germany 1740 for Spain ; to the Phillipines 1742, and then by way of Goa to Surat, 1743 ; worked in India till death. Good linguist, mathematician, and astronomer, and devoted to geography.

Bernoulli ; Blunt ; Noti ; Maclagan (137–8).

From Surat his first journey was to Damān and back ; 1744, moved to Agra, via Broach, Udaipur, and Dīg, making astr. obsns. on the way. Obsd. lat. of Agra, and in 1745 visited Jai Singh's observatory at Muttra [150].

1746, left Agra for Delhi, and thence to Narwār, Central India, where he ministered to Christian Community for the next 18 years. 1750, travelled to Goa via Mālwa and Bombay ; then by Surat, Bombay, Guzerāt, and Mārwār, to Ajmer, and returned to Narwār 1751, making other expeditions later [11].

After suppression of the Jesuit order [12], and death of the Armenian Governor at Narwār "Tieffentaller found himself one day a pastor without a flock ; worse yet ; he was a penniless man, wanting even the necessaries of life. ... He conceived the bold plan of making his way to Bengal, and appealing to the charity of the English".

In 1765 therefore he travelled down to Calcutta, keeping surveys all the way, "la Boussule à la main"[8]. Having there apparently found the help he needed, he travelled up to Lucknow, and settled in Oudh for the remainder of his life. Till 1771 he was continually on the move making astr. obsns. and surveys, employing also one or more local assistants "versed in Geography", whom he sent to explore the sources of the Ganges and Gogra [5, 11–2, 72–3, 151, 222].

1775, Sent home from Fyzābād a large collection of maps and geographical papers ; as Jesuit hdqrs. were now closed he sent the maps to Duperron at Paris and the writings, all in Latin, to Copenhagen. Duperron published the maps with commentary of his own, and a general map on reduced scale [72, 309–10], and Bernoulli reproduced these both in German and French, with translation of Tieffenthaler's major works, the chief of which was his *Descriptio Indiae*, a gazetteer of India, with account of his travels, [11–2, 80, 214, pl. 6, 309–10].

Amongst other papers sent home, all in Latin, were,

"Indian Astronomy and Astrology".

"Natural History of India ; animals, birds, trees, plants and flowers ; also Meteorological Observations covering a space of 26 years, with astr. obsns. covering the same period".

"Course of the Ganges, together with a description of the villages and cities lying on both banks".

"Course of the Ganges, from Priaga or Chlabado[9], to Calcutta, explored with the aid of a magnetic needle".

"Course of the Jumna, which is numbered among the great rivers".

"Other Geographical maps, which show various coasts of India".

"Drawings of Cities and Forts, Temples, Idols, and Mountains".

"Catalogue of the Places, whose Geographical Latitude has been observed".

"A paper entitled "De Longitudine et Latitudine Indiae"[10].

Amongst several of his papers that reached Orme are a letter to General Richard Smith, and a review of D'Anville's maps, in which he points out that, "Pour Connoitre le Latitude et Longitude, la grandeur des villes considerables de l'Inde, leurs situations, et autres choses remarquables de cette vaste Empire, on consultera la description latine faite par le P. J. T. S. J."[11].

Some of his maps reached Thomas Call in Calcutta by 1784 [12], probably through Wilford [397], who visited Tieffenthaler at Lucknow in 1784, a year before his death.

An account has already been given of the use that Rennell made of the publications by Duperron and Bernoulli, and how he had subsequently to reject Tieffenthaler's version of the upper course of the Ganges [72–3].

Though he died at Lucknow, Tieffenthaler's body was interred at the Padri Tolla cemetery at Agra, where the headquarters of the "Mogor" Mission had been for many years.

[1] Family name being Cossard. [2] Orme MSS. X (2388). [3] *Three Frenchmen* (41). [4] Dodwell (43). [5] Ben. Wills. 1765. [6] Spelling of *Imp. Gaz.* ; elsewhere sometimes –thaller or –taller, the latter being used by himself. [7] Sometime Botzen or Bozen. [8] Bernoulli, II (292). [9] Allahābād. [10] *Bibliothèque de la Société de Jésus*. Sommervogel, S J., Paris 1932. [11] Orme MSS. 23 (51).

TIRETTA[1], Edward. Civil Architect, Calcutta.

m., Angelica de Carrion.

1768, Engaged in building contracts etc. in Calcutta[2].

1780, Appd. Civil Architect; Jan. 1781, Appd. Surveyor and Registrar to the Commissioners of Police; started detailed survey and levelling of Calcutta city, but lack of funds led to its completion by Engineer officers [52, 268].

Probably best known for the lottery bearing his name, which he ran for many years; Hastings writes home to his wife, 6–2–84, "Tiretta's Lottery is drawn and the Prize has fallen to himself"[3].

1792, still Civil Architect, and in *C G.* 21–1–93 there was adv. the "Sale by auction, House & Extensive Gardens, Grounds, & Offices, at present occupied by Mr. Edward Tiretta, valued, with house & offices opposite together in Tiretta's Lottery, at Sicca Rs. 60,000".

C G. 24–4–94, "at a General Quarters Session of the Peace at the Town Hall, Mr. Edward Tiretta was appointed *Surveyor* to the Court".

1797, Wrote to Hastings to congratulate him on the result of the trial and to introduce his sister-in-law, Miss Josephin Carrion, who was going to England to receive "an Education suitable to her birth, and my family"[4].

TOPPING, Michael. Mar. Survr. & Astronomer. b. *c.* 1747. d. 7–1–96, Masulipatam; M I.

Nothing has been found about his family, education, or early life, but his sound knowledge of mathematics, astronomy, and survey, and the fact that the course of instruction he laid down for the Surveying School in 1795 was "the same that is followed at Christ's College"[5], suggest that he may have been educated at Christ's Hospital, London. His name is not found in the school registers[6], but it is known that the mathematical master of those days took private pupils, one of whom was Warren Hastings.

Topping arrd. Madras 1785, and, presumably on his voyage out, made astr. obsns. near the Maldive Is. and along the coast of Ceylon, as noted by Rennell who adopted "Mr. Topping's observations of latitude and longitude in 1785" of the "northmost Maldive Island", and says that "when opposite to it on the north, he counted 32 islands"[7].

In the Town Major's Register of 19–1–89 he is shewn as "Surveyor, arrived from England in 1785, by permission of Government"[8].

The inscription on his tomb [392–3] states definitely that he was sent out to India for the purposes of astronomy, and that his expenses for the journey were paid by the Company; he himself says that his services commenced before he reached India [392], and though no confirmation has been found in official records, it is possible that he was sent out at the suggestion of Dalrymple, who had inspired the orders for the survey of both the east and west coasts [125, 164]. Topping's methods of survey in many ways resemble those recommended by Dalrymple [184, 190].

Nov. 1786, he had made a journey by land from Masulipatam to Calcutta, fixing the position of every important place on the way [101, 170, 202–3].

He made the return journey in the Company's ship *Walpole*[9], and the Council write to the Directors, "We forward herewith a journal kept by Mr. Topping on board your ship *Walpole* during her passage from Kedgree to Madras in 1787, with a chart of the Bay of Bengal shewing the effects of the currents on the ship's course, and the position of certain places on the coast"[10], to which the Directors replied; "The communication of like materials, when a proper number can be accumulated, will be extremely useful in giving a rational foundation for a theory of the currents in the Indian Seas, a perfect knowledge of which would be of the utmost importance in Peace or War"[11] [376, 377].

The Council then deputed him to survey the Coromandel coast towards the south, taking astr. obsns. with instruments he had brought out from England [5–6, 101–3].

Before setting out on this survey Topping arranged for the use of Petrie's private observatory, with John Goldingham as observer, to take obsns. of Jupiter's satellites at Madras corresponding with his field obsns. [171–2].

As he could not get a ship, he made his survey entirely by land, observing a series of triangles along the coast. Leaving Madras at the end of Jan. 1788 he returned in Dec., reporting "that I have made considerable progress in my Survey of the Sea Coast southward; and that, being advanced as far as Kistnapatam, a distance of near 300 miles from Madras, I have left my instruments and other implements at that place, in order to continue as soon as possible"[12] [190–1, 200].

In another account[13] he writes, "In all the operations I have had no one to assist me, except a party of black fellows to carry my flags [102, 290]. I need not tell you how many thousands of miles I have travelled to take the angles; nor what the labour and fatigue of such a work must be in this burning climate, where I have frequently had the Thermometer at 106° in my Tent".

He was such an ardent advocate of regular triangulation that it would be interesting to know whether he had ever had experience of triangulation before he came to India [174, 175, 190, 193]. He was, indeed, the only surveyor before Lambton who had expressed any conception of a great trigonometrical survey of India, though it is doubtful whether he had the necessary knowledge of geodesy to have carried such a work through himself [190]. Topping would indeed have been thrilled had he known of Lambton's great work that was so soon to come, and that his own coastal series would be incorporated

[1] Described as Tarvisini on his wife's tomb; probably indicating his origin from Tarvis, in the Julian Alps, 60 m. N. of Trieste. [2] B P C. 29–8–68. [3] Grier (242). [4] ib. (230). [5] D Dn. 133 (302), 17–1–1807. [6] No record found at Admiralty nor India Office. [7] *Memoir*, 1793 (45–7). No record found amongst Dalrymple's papers, from which Rennell might have got such information. [8] I O. List of Eur. Inhabitants Ft. St George. [9] Probably between 18–4–87 and 14–5–87. I O. Logs; *Walpole*. [10] M to C D. 1–3–88 (11). [11] C D to M. 8–4–89. [12] M P C. 8–12–88. [13] *Phil. Trans.* 1792, I (99–114).

into Lambton's triangulation of the South Peninsula to fix the position of Point Calimere[1].

At Madras he arranged for the purchase of a small cutter, shewing a sailor's experience in selecting one that should be admirably suited for his coastal surveys [103]. He was not able, however, to complete his survey to the south, for the Directors had called for a survey of the Bay of Coringa and the mouths of the Godāvari R. and a report whether there was any safe accommodation for large ships during stormy weather.

He started this survey Aug. 1789, finding his cutter *Mary* of the utmost service: and sent in his charts from Masulipatam before the end of Feb. 1790 [103, 172].

It is a decided compliment to Topping that his survey and report on Coringa Bay and the Godāvari should have been considered of sufficient importance to be pub. by the Mad. Govt. in 1855, and that the Marine officers who were employed on examination of "the Harbours and Ports of the Northern Circars" in that year, found themselves "in full agreement" him[2].

During 1790 he raised the question of establishing a Govt. observatory at Madras, and with the Council's approval started looking for a suitable building and site, and was eventually allowed to purchase "Mr. Garrow's garden house including the grounds" in Sept. 1791, and to commence building [163, 172–3, 338, 348].

After a vigorous controversy with the C E. about designs and plans, he was allowed to proceed, and the observatory was ready before the end of 1792 [104, 173, 180].

He had many other duties whilst the observatory was being discussed and constructed.

In a letter dated 20–8–88 the Directors had suggested that, among other tasks, he might "be employed in determining the positions of places on the east side of the Bay of Bengal down to Prince of Wales's Island, and from thence, by Acheen, down the West coast of Sumatra to the Strait of Sunda; in the course of which voyage he will be attentive to take views of all the lands".

He was not able to carry out so ambitious a programme, but the following extracts are taken from his journal of a voyage made between Sept. 1790 and March 1791 which was pub. by the Mad. Govt. in 1855, with the comment that copies of "Topping's journals & Sea-Logs on his several cruises across the Bay of Bengal, (which for method and accuracy have never been surpassed)" will be available when required[3].

Journal of a Voyage in the Bay of Bengal, undertaken with a view towards ascertaining the set and velocity of the currents in that extensive gulf.

"Encouraged by the approbation bestowed...on my former attempt to discover the course of the currents in the Bay, I embarked in September 1790 on board a small cutter that had been provided for my coast surveying. ... In this vessel I left Madras the 25th September 1790, taking with me my two Chronometers, and some other instruments (173, 203). ...

"After putting into Nancovery[4] in bad weather, I proceeded to *Prince of Wales Island,* from whence I originally proposed to coast the Straits of Malacca with the Chronometers, but was dissuaded...by the friendly advice of Mr. Light [46], who represented to me the hazard I was about to incur of being cut off by the Malays, at that time assembled in large bodies with armed Prows, for the purpose of attacking his Island. ...

"During my stay at Pinang, I commenced and made considerable progress in a Survey of that safe and well situated Harbour; but the Malay pirates presently interrupted and frustrated the undertaking, by carrying off my signals, and engaging the attention of every one at that place".

After remarking on the currents of the Bay he continues, "Besides 18 drawings or views of land, there is subjoined to this journal a Series of Observations made for determining the Latitude, Longitude, and variation of the magnetic Needle at Prince of Wales Island".

Extracts from the "Log of the cutter *Mary*, from the Southern Nicobar to Nancovery Island".

6–10–90. "When we left Madras we had on board not more than eight casks of water, the most we could stow, and three of these we were obliged to lash upon deck. Yesterday morning we opened our fifth cask, and during the gale the hoops had all started from our largest cask (a *new one*, just received from the Company's stores); and our quantum was there by reduced to two forty-gallon casks, or *six days water only with economy*.

"The driving of the rain had killed almost all the remnant of our livestock. This state of things made it absolutely necessary for us to seek some port of safety where we might meet with a speedy supply, and it was lucky for us that the fine accessible harbour of Nancovery happened to lie under our lee at the time [16]. ...

"Went on shore...but found no European there to support, with due parade, the King of Denmark's presumtive authority in the island. A country-born, Dutch-descended, Serjeant, was *Commandant* of the place. ... The whole duty required of them seemed to be, to hoist a Swallow-tailed Danish Flag upon a bamboo pole; to take charge of three or four old, ill-mounted, unserviceable iron guns, and a few rounds of powder and ball, given them *for the defence of the settlement*! and (the most difficult task of all) to preserve themselves from the pressing attacks of hunger and disease [48–9]. ...

"Landed at Pinang October 23rd. Saluted the Fort with 9 guns, which was immediately returned by an equal number". Describes attacks by Malay pirates; sailed from Penang, 23–12–90.

"Jan. 1st. Sailed into Port Cornwallis [48, 49]; ... anchored on the North side of Chatham Island. ... Landed; ...found there the Superintendent, Mr. Blair [313]". Took astr. obsns. with Blair, and describes the island and people.

"There are several other harbours in the Great Andaman besides Port Cornwallis. Capt. Blair has surveyed the whole, and constructed a general Chart of the Island upon an extended scale. This, when it comes to be published, will be a valuable acquisition to geography, as it not only contains information of a new and very useful kind, but is a work of

[1] Lambton's Report, D Dn. 63 (279), 11–2–1812. [2] *Mad. Sel.* XIX 1855 (1). [3] ib. [4] Nancowry Harbour [48–9].

great labor and merit, and such an one ought for the security of the ships that navigate the Bay of Bengal, to have been executed many years ago".

Topping's journal contains a description of "Quedah, (pronounced Kuddah)" and other ports, "Chiefly from the information of Francis Light Esq"[1].

He arrived back at Coringa, 10–3–91, after visiting Calcutta.

On return to Madras Topping had to attend to the affairs of the observatory, and, the campaign against Tipu being in full swing, took up the construction of gun carriages. There was some discussion in the Council as to whether he should not carry out a survey required at Masulipatam, or continue his survey towards Cape Comorin, but he suggested that, rather than undertake distant surveys at such a time, he might with Goldingham's assistance carry out the survey of the Pulicat and Armagon shoals, and still keep in touch with the work going on at the observatory [104, 181 n. 3. 192, 338].

This was approved, one of the members noting; "I agree to the resolution because Mr. Topping's attention is at present required by a duty of more immediate importance than either, namely the business of his contract for Gun carriages, which was confided to him in the expectation that his singular mechanical abilities would produce considerable improvement in the construction of that essential article. The Military Board have lately given him an order for making up sixteen 18-pounder Gun carriages, and the ships with timber from Pegu are just arrived; if then there be any solid ground for the above expectation...Mr. Topping could not at present proceed to the distance of Cape Comorin, with convenience either to himself or the other Branch of the public service entrusted to him"[2].

In 1789 Topping had put in papers and drawings of a "new depressing Gun-carriage", or "screw-coin" which he had devised. The local Comdt. of Art. thought very highly of this, writing 31–7–92; "the ease with it is worked, and the certainty with which a gun may be laid by it, surpassed any idea I had formed; I am fully convinced of the great advantage which will be found by using it with all heavy guns. ... I am also much pleased with the experiments I have seen made with your covered-way carriage, which will certainly answer fully the purpose for which you constructed it".

The designs were sent to the Royal Military Repository in England, but were found to have been anticipated in principle by contrivances of greater simplicity and practical advantage[3].

Topping seems to have stayed in Madras throughout 1792, occupied with the observatory, whilst the Pulicat shoals were survd. by Goldingham [104, 167, 369].

Orders now came from the Directors that he should survey the Kistna and Godāvari deltas for irrigation purposes. After a visit to the Tanjore anicut [106] he left Madras, with Caldwell as asst., at the end of March 1793, to start the new survey from Masulipatam, The following Feb. he submitted a report on his survey and levelling, and made recommendations for a more detailed survey [7, 105–6].

He then took up the question of the drainage of Masulipatam and its surroundings, reporting 17–12–94, "I take the liberty of laying before Government a survey of the Post and Environs of Masulipatam, made by myself during the course of my late operations in the Circar.

"Having frequently noticed the situation of the Fort of Masulipatam in a *Swamp* or *Morass;* and being convinced that the unhealthiness of the Garrison there has arisen principally from the putrid Vapours exhaled from the low and Marshy grounds that surround it, I turned my thoughts towards the natural remedy—*draining* and *embanking*. ...

"Situations on the Sea-Coast are found in general to be healthy; Masulipatam is the only exception to the rule that falls within my immediate knowledge. ... Perhaps, therefore, if that place were to be secured from the effects of the Sea and Land floods, it would be as healthy a situation as any one on this Coast[4].

"The service suffers a great and melancholy loss of Europeans annually at Ellore. The intense heat there during the months of May and June are such as scarcely any European constitution can endure. At that season the *borders of the Sea* are the natural Retreats of those who dread the inclemency of the weather, and even Masulipatam itself, under all its past and present disadvantages has been found beneficial to many who would probably have fallen a sacrifice to the rigors of the Climate had they remained at Ellore". After discussing the proposal to move cantonments from Ellore to Bezwāda, he continues; "Perhaps however if Masulipatam were to be improved in the manner I have suggested, the Climate there, owing to the Vicinity of the Sea, might have the advantage for European constitutions".

His suggestion was approved, and in March 1795, he submitted "a full report and *plan* of the embankment scheme he proposes for purifying the putrid swamp which infests the garrison and its neighbourhood". He was ordered to put the work in hand and "to observe as strict an economy...as the service will possibly admit"[5].

Amongst maps preserved at Madras 30 years later was one "250 yards to an inch. The Port and Environs of Masulipatam, with the Embankments, Canal of Navigation, and other improvements executed in 1795–6".

M R C. 7–11–95, the Council wrote that though the President was "fully sensible of the utility of the works you have carried on at Masulipatam, he shall be apprehensive that they may eventually be detrimental to the public service, should they be found to engage too much of your attention—and prevent your abilities being directed to the particular objects for which you have been specially appointed"[6].

At the same time Topping was ordered to visit "the Havellies of Chicacole and Vizagapatam" [144 n. 1], where considerable devastation had been caused by the destruction of the banks of the tanks, and on Nov. 13th he reported from Masulipatam "that a fortunate interval in my operations at this place enables me to visit the Chicacole and Vizagapatam Havellies without detriment to my present undertaking". This was his last work, for he returned with raging fever, and died at Masulipatam, Jan. 7th 1796.

It is particularly disappointing that we know nothing of Topping's early life or education, for he had outstanding talent and strong character, and had he been a convenanted civil or military servant would undoubtedly have risen to high rank [193, 268].

In a letter of 16–5–92, the Directors appd. him "Astronomer and Surveyor", and gave him control of all surveys that were not of a military nature [253, 257]. He urged that such responsibilities were rightly those of a Surveyor General, and in their letter of 23–4–94 the Directors appd. him "Company's

[1] *Oriental Repertory*, I. & *Mad. Sel.* XIX (47–50). [2] M P C. 27–12–91. [3] C D to M. 15–6–93 (85, 94). [4] *cf.* M to C D. 4–11–1767 (14), "Masulipatam...does not appear to be remarkably unhealthy, and when the Ditch and Sluices are finished... we are given to hope that the offensive Exhalations formerly arising from the Slime and Mud which surrounded the place will in a great measure be removed". [5] M M C. 17–3–95. [6] D Dn. 246 (112).

Astronomer and Geographical Marine Surveyor" under the Madras Presdy., without however making any increase to his allowances [263–4, 280. 312].

Topping protested against this lack of consideration, pointing out that in addition to the duties specified there was also "the office I virtually fill of Civil Engineer", and he urges "the length of time I have toiled in the service, the rigors and disappointment I have experienced, and my perseverance in adhering to the Company's Employ, through every species of difficulty and disappointment. ...

"The convenanted servants of the company come out at an early period of life to India, and rise by *sure*, if not rapid, steps into situations of trust and emolument. The military candidates for fame and reward have also the advantage of rising rank, as well as the pleasing prospects of future independence to excite their activity for public good; both have their professional knowledge at first to acquire, and are for some years after their arrival little more than *Noviciates* in the service of the Company. With *Me*, however, circumstances have been somewhat different; *My* services commenced *even before* my landing upon the coast of India; at a *riper* season of life than usual; nor has my situation been attended with the advantages of rising rank and consequence, or official *emolument* of any kind above my bare salary".

He urged that "the sacrifice I have made of every other prospect in life to the service of the Company; the losses I have sustained by that sacrifice, and a long and tedious absence from my family (whose presence in this expensive country my present scanty allowances will by no means admit of my being consoled with) are deserving of more than a bare supply for the current expences a person in my responsible situation must of necessity incur; and that perpetual exile from my native home would be but an ill recompence for my faithful and zealous exertions to serve the company"[1].

The office of Civil Engineer to which Topping refers covered various irrigation projects [107–8], and to meet his lament, he was appd. "Superintendent of Tank Repairs and Watercourses", with an extra allowance of 400 *pagodas* a month, drawn from the Revenue Dept., and apparently his first increase of pay since first appt. [280].

Probably his most valuable contribution, after the founding of the Observatory, was his suggestion of an est. of asst. survrs., and of a school for their training; this he put forward in Jan. 1794, and all preliminary arrangements for recruiting the first batch of boys and starting the school were made by him [108, 145, 283-4].

It is a tribute to his abilities that after his death his duties were distributed amongst three officers; to Goldingham the duties of Astronomer in charge of the Observatory, Marine Surveyor, and Superintendent of the Surveying School; to Beatson the survey for the "Watering of the Circars", and to Caldwell the duties of Superintendent of Tank Repairs.

Amongst difficulties to which Topping referred as "unpleasant circumstances that have occurred, ... numerous difficulties, embarassments, and jealous oppositions I have encountered, for want of my official situation being duly confirmed and supported", were encounters with Capt. George Johnstone, in charge of Engrs. at Masulipatam. Johnstone tried to interfere with Caldwell who was uncertain whom to obey; he removed "a shed in which a boat was being built"; "siezed and detained some dead stumps" felled in the course of Topping's work; and "publicly menaced to imprison Mr. Topping in the Main Guard"[2].

The Council wrote to Johnstone "cautioning him against throwing any further impediments in the way of Mr. Topping, ... and to state the authority by which he considered the *Portia* wood felled by Mr. Topping...as his private property". They also wrote to the C-in-C. expressing "great displeasure at Capt. Johnstone's conduct in constantly impeding the works of Mr. Topping"[3].

On the other hand the Council had to write to Topping "disapproving the style of his letter to Col. B— of 21st August, and recommending that in preferring complaints, he express himself in terms more suitable to official correspondence". It is disappointing that the offending letter has not been preserved.

Five years later, Johnstone's conduct at Masulipatam led, Jan. 1800, to his arrest, ctml., and dismissal[4].

In another letter Topping points out the trials of a surveyor's life, which require "a constitution capable of enduring the greatest fatigues, in the most trying and destructive climate; The Hon'ble Board will be pleased to recollect the mortality occasioned in the Circars by the unhealthiness of last season, when, even at Masulipatam, besides some thousands of the unhappy natives, full two thirds of the Gentlemen established there by the Company died between the months of May and November; and yet none of the latter were exposed to the severities of the weather; but enjoyed the comfort of capacious Houses, a regular and tranquil employment, and even the luxury, during the hot season, of air artificially cooled to a refreshing temperature"[5].

Topping had other interests besides his work; "An issue of Boyd's *Hircarah* of January 1794 supplies an account of a concert of sacred music at St. Mary's Church in aid of the Male Orphan Asylum. Mr. Michael Topping acted as organist, Capt. Beatson with Messrs. —— and Caldwell took the violins"[6].

The artist Wm. Hodges writes "The annexed plate, a view of the great Pagoda at Tanjore, is from a picture which I painted from an accurate drawing made by Mr. Topping, an ingenious friend of mine, now on a survey of the coast of Coromandel".

It would be interesting to know how far Hodges commits himself by referring to Topping as a "friend of mine". Hodges was in India from 1778–84, leaving before Topping's arrival, and there was hardly time for them to have met in the interval before Topping reached India in 1785, which would imply that their friendship dated before Hodges left England.

Another possible clue to Topping's early associates is that in 1789 he sent the account of his survey of the coast to Tiberius Cavallo, F R S. [191]. Amongst MSS. preserved at the observatory many years later, but unfortunately no longer extant, were Topping's Journal of Oct. 1783; his Log Books of 1785, and 1789–91; and a Book of Views[7].

The following epitaph was inscribed on his tomb at Masulipatam; "H. S. E.[8] integer et urbanus, cui summae fuerunt animi dotes ad extremum fovit, machinarum minus artifex, necnon in literis humanioribus ac musicis veratus,[9] Michael Topping, mathematicus admodum solers; ingenii multa quidem pignora posteris[10] reliquit et missus in has regiones astronomiam excolere, societatis mercaturae in India orientali[11] faciendae sumptibus, speculam sideralem juxta sancti Georgii arcem formavit et posuit; officio

[1] M R C. 7–2–95. [2] Vibart, I (280). [3] M M C. 200–1795 (4058). [4] Vibart, I (412). [5] M P C. Feb. 1794. Letter of 14–2–94. [6] Love III (444). [7] D Dn. 127, 21–10–1811 & later. [8] Hic Sepultus est. [9] read *versatus*. [10] read *posteria*. [11] "the society trading in East India".

functo promittens majora occubuit febri, Jany. 7th. A. D. 1796, aetat 48."

This may be interpreted, "Here lies buried an honest gentlemen, Michael Topping, of great intellectual gifts which he cultivated till his end; of outstanding mechanical ability, and at the same time versed in letters and music. He has left to posterity many proofs of his ability, and having been sent out to this country at the expence of the E I C. for the advancement of Astronomy, he designed and erected near Fort St. George an astronomical observatory; having fulfilled this trust, and giving promise of yet greater achievements, he succumbed to a fever, January 7th 1796, aged 48".

Of his domestic life, we have recorded his letter of 1795[1] [392]; in his will he "leaves all property to my dear & excellent friend, Mrs. Elizabeth Picart, late of Montrieul Summer in the Kingdom of France; ... in event of Elizabeth Picart not being living, the estate to pass to Elizabeth and Sarah, her daughters".

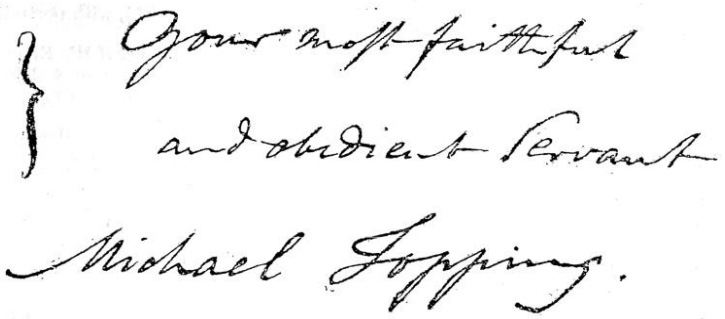
Administration was granted to "Cecil Smith[2], Mrs. Elizabeth Smith, and John Goldingham; the first the son-in-law, the second the daughter, and the third the friend of Michael Topping".

C M. 1–12–90, "Miss Elizabeth Topping allowed to proceed to her friends in Madras"; she was married to Cecil Smith 10–5–93. Though Elizabeth thus appears to have joined her father in 1791, her mother and sister Sarah did not arrive till after his death; *C G.* 14–7–96; "Following list of persons who were for many years prisoners with the French had been permitted to embark on a French ship for Madras; they arrived at Tranquebar on 19th ult.; ... Mrs. & Miss Topping".

The only other Topping whose connection with India has been found is a Timothy Topping, son of Timothy & Sarah; b. London, 18–10–81, and appd. 4th mate of the Indiaman *United Kingdom* in 1801.

Admiralty Records show a George Topping, Chaplain in 1747, and a William Topping, Lieut. 1761–3.

For one reason and another Topping seems to be the most intriguing figure amongst all our surveyors of 18th century [193 268], and here is his autograph,



TORRIANO, John Samuel. Bom. Art.
b. 1750–1. d. 27–2–1825.

Fwkr. 28–4–68 ... Maj. 14–9–84; Ret. 1788.

Son of Charles Torriano, Capt. R A., and Jane his wife. Family from Thurn and Taxis, Wurtemberg.

Ed. R M A.

m., Bombay, 2–10–87, Miss Jane Boys.

DIB.; *EIMC.* II (117); Spring gives portrait from a miniature. M I., Kensington Church.

Arrd. Bombay 1768; 1770, accompanied as survr. and dman, a secret embassy to Poona, which was turned back owing to French influence, 1772. Appd. "one of the surveyors of the extensive fortifications then carrying on at Bombay", and then comdd. the Art. at Surat. Distinguished himself in the wars against Marāthas [121].

1776, "accompanied the British ambassador [Mostyn] to Poonah, in the command of his... guard...; but with secret directions from the Select Committee at Bombay, to take privately such surveys of the roads and views of the forts as could be effected without alarming the Mahratta Government, and, to more effectually accomplish this purpose, he travelled to Aurangabad and other cities in the Peninsula of India. On his return to Bombay in 1777 he delivered in...his surveys and other documents; ... for his services he received the thanks of Government, and the rank of Brevet Captain of Artillery"[3].

Reynolds embodied this survey into his map of 1787 [121].

Comdd. Art. with Goddard's army 1789–81, and at capture of Onore 6–1–83, and after the disaster at Hydernagar or Bednur, held Onore against siege and blockade with great determination and skill for seven months[4] [125, 378]

TURNER, Charles. Bom. Engrs.
b. 1744. d. shortly before 7–4–83[5]; Bombay.

Fwkr. (Art) Nov. 1767; to Engrs. on formation 2–8–75; ... Maj. 26–12–81.

Son of Mary Turner, and nephew of Rev. William Young of Helmingham, near Ipswich, and of Edward Young, Surg. R N.

Left a natural son, Charles Turner, b., 25–3–81, to "my Housekeeper Mary Lofthouse"[6].

25–8–72, employed in the Art. Laboratory at Bombay, Appd. to survey Bom. I. [147].

Nov. 1772, as 1st Lieut. Art. "assisted as Engineer at the reduction of Broach", and, 14th Dec., directed "to take charge of the Fortifications and Public Buildings" there. Recalled to continue survey at Bombay, 29–11–72, and again 19–10–73, but no record of such return, and eventually drew pay as Engr. at Broach 14–12–72 to 31–12–77 [273][7].

1775, with Keating's force to Ahmedābād [121].

1777, Elected for tr. to Engrs. as Capt.; antedated to 2–8–75[8].

April 1779, Stationed at Bombay; ordered to return to Broach to complete survey previously

[1] Madras Wills, 1796; see also *Oriental Obituary*, 1809, I (38). [2] Mad. Civ.; Writer 1790; Civil Auditor 1800; Acctt. Gen. 1807; d. 8–12–1813, at Cape of Good Hope. [3] *EIMC.* II (117). [4] ib; Forbes (107). [5] Will pr. 7–4–83; O C. Troops reports vacancy caused by his death, 9–4–83. [6] Bom. Wills, 1783 (32–5). [7] Bo P C. 23–8–80. [8] ib. 3–12–77.

commenced there. Survey and map completed and sd. 25–8–82 [4,122]; astr. obsns. at Broach [176].

TURNER, Samuel. Ben. Inf.
b. *c.* 1759. d. 2–1–1802, London.

Ens. 1780 ... Capt. 18–3–99.
Son of John & Ann Turner; 1st cousin of Warren Hastings.
F R S. 15–1–1801. *D N B.*; *D I B.*
April 1780, Sailed for India at age of 22. Joined Hastings at Bankipore March 1781, and appd. A D C. to G G. 27–3–81. With G G. at Benares on outbreak of Chet Singh's rebellion and on flight to Chunār Aug. 21–2 [35 n. 8].
1782, Comdt. G G.'s Bodyguard till furl. on account of bad health, Feb. 1797.

Embassy to Tibet, 9–1–83 till March 1784, travelling by way of Bhutān [74, 332]; convinced that Tsangpo was one with Brahmeputra [80]. Author of *An Account of an Embassy to the Court of the Teshoo Lama in Tibet.* "This relation was published in 1800[1]. ... It is exceedingly curious and interesting. The author whose amiable manners and good qualities had endeared him to his friends, was siezed with an apoplexy as he was walking the streets of London, and died within a few days"[2].

UPJOHN, Aaron. Printer & Dman.
d. 21–6–1800, Calcutta.

Son of James & Mary Upjohn, England.
4th Asst. to S G. 3–10–99.
"Reached India in the humble capacity of bassoon player in a ship's band"[3].
"I came to India in the year 1785, bringing with me several respectable Letters of Recommendation" to the Governor of Madras and to Colonel Sydenham [361, 387]; "but owing to misfortunes, unsuccessful connections in business, I am now involved in a Debt of so serious a nature, that almost precludes the Possibility of my ever revisiting England"[4].
It was possibly Upjohn who put the following adv. into the local paper, *C G.* 4–8–85. "Just arrived; A Person who is acquainted with Architecture, Land and Marine Survey, having been under the first masters in England. He has been in most parts of the world and speaks French and Italian".
Printed the *Calcutta Chronicle* for Baillie [310] and in 1792 owned one sixth share in the paper and press.

1791, Commenced a large scale survey of Calcutta and environs, as a commercial venture, and the following year issued an adv., *C G.* 19–7–92 "Plan of the River from Fort William to Sooksaugor. Mr. Upjohn, under the pressure of the late unfortunate change in his circumstances solicits the encouragement of the Public.
"A neat & accurate plan at the moderate price of One Gold Mohur. Impression taken from Copper plates elegantly engraved, ... and to render the plan convenient for the pocket, it will be fixed on a small roller about 8 inches in length. Mr. Upjohn pledges himself that, should the accuracy of Delineation & Neatness of execution not meet with the Approbation of those who may oblige him with their names the amount of subscription shall be immediately returned".

1794, Issued his "Map of the Town of Calcutta and its environs", of which Govt. took 40 copies at Rs. 60 each. He is said to have completed and published the map in "18 months, a feat which so far from obtaining praise, was censured by his contemporary critics, as proof of careless haste, as they considered that such an undertaking required at least 2½ years for its proper completion[5] [54]".
Shortly after this became Head Dman. in S G.'s office and, Oct. 1799, appd. Junior Asst.[6] [271].
The following month, Appd. to survey the coast of Chittagong, and in spite of constant ill-health carried survey down to Cox's Bāzār, where heavy weather early in April stopped further work to south; left an interesting journal [65–6, 268–9].
Nominated Richard Blechynden of Calcutta as one of his executors.

WALFIELD,——. Ben.

Nothing further known.
Cursory survey of the "Junglebari & Isamot" creeks before 1770[7].

WATHERSTONE, Dalhousie[8]. Ben. Inf.
d. before 1803.

Ens. 19–11–71 ... Capt. 24–2–81; Resd. Nov. 1782.
m. Jane, dau. of Rev. Thomas Walker.
Paymaster with Goddard's Dett. and, on breakdown of Elliot's mission [39], sent by Goddard to Nāgpur, keeping survey of route from Hoshangābād to Nāgpur[9].
Inherited considerable share of Goddard's estate of £106,000, and became M P[10].

WATSON, Henry. Ben. Engrs.
b. 1737. d. 17–9–86, Dover.

Capt. 1–5–64; ... Lt Col. 10–1–75;
Resd. 8–1–86 [258].
Son of a grazier at Holbeach; Ed. R M A.
m., Calcutta, 28–6–80, Maria Theresa, sister of Thomas Kearnan, Ben. Inf.; left one dau. who m. George Evans, 4th Baron Carbery.
D N B.; *D I B.*; *Eur. Mag.* Dec. 1786 (497), with portrait by John Smart, in uniform of 52nd Foot.
Ens. H M's 52nd Foot, 27–12–55; ... Lieut. H M's Engrs. 17–3–59; H M's 97th Foot 23–2–62; Capt. 104th Foot 4–2–63.
To Bengal 1764; resd. 1772, and returned to England.
10–1–75, Appd. C E. Bengal; arrd. Nov. 1777.
17–8–79, Second to Philip Francis in duel with Hastings [362]; 1780, Founded dockyards at Calcutta [347].
"To Colonel Watson unquestionably belongs the honor of having established the first dockyards in Bengal. ... He... obtained a grant of land from Government at Kidderpore. ... His works were commenced in 1780; and the next year he launched the *Nonsuch* frigate of 36 guns. ...
"He devoted his time and his fortune to this national undertaking for eight years, and in 1788 launched another frigate, the *Surprize*, of 32 guns; but his resources were by this time exhausted; after having sunk ten lakhs of Rupees in his dockyard, he was obliged to relinquish it"[11].
Patron of Francis Wilford [395].
Friend and patron of Reuben Burrow from 1775; persuaded him to come to India, and had him appd. instructor to Engr. officers in astronomy for survey purposes [156, 157, 163, 270].

[1] Repub. in French, Paris. 1800. [2] Teignmouth, II, (18). [3] Blechynden (183). [4] B P C. 11–11–93. [5] Blechynden (183) [6] B G O. 4–10–99. [7] Possibly in 78 P. Orme MSS. xi. [8] Name wrongly given as Daniel. Wills (61–4). [9] *Memoir*, 1793 (236). [10] Holzman (28, 167). [11] Review of Joseph's map of Hooghly R.; *Calcutta Review* III.

WELLS, Edmund. Ben. Inf.
b. 1755–6. d. 12–11–94, Rāmpur[1], of wounds received in action.

Ens. 6–10–80; Lieut. 6–7–81.

From Stratford-on-Avon; d. unm.; M I. St. John's Churchyard, Calcutta.

1786–7, Adj. 14th Batt. Sepoys. A D C. to Col. John Fullarton till 5–2–90.

Bri. Maj. to Cockerell's Dett. which marched down the east coast, leaving Midnapore 22–3–90, arriving Conjeeveram[2] 1–8–90. During return march, starting from Nellore 28–9–92 and closing in Bengal 21–1–93, Wells survd. route by compass and perambulator, with frequent lat. obsns.[3] [43].

Comdg. troops in Andaman Is. 1793–4, under Kyd [346], occasionally acting as Supt.; 2nd Rohilla War, severely wounded 26–10–94.

WELLS[4], William. Ben. Art.
d. 15–8–55, Calcutta.

Ens., Aug. 1753; Lieut.

C M. 8–11–52, Appd. Lieut. of the Company of Art. on the Coast of Coromandel; arrd. Madras, Aug. 1753, and moved to Ft. William, apparently exchanging with Robert Barker [311][5].

1753, Survd. Ft. William and part of Calcutta. His plan shows house No. 27 as occupied by "Capt. Wills" [51][6].

Left in charge of the works at Ft. William on Scott's transfer to Madras, 18–3–54 [93].

WENDEL, Father Francis Zavier. S J.
d. 20–3–1803, Lucknow.

Belgian or German by birth.

Came to India 1751; 1763 at Lucknow; 1769 sent to Agra, and "seems to have resided at Lucknow and Agra for the greater part of his life".

"Fathers Wendel and Tieffenthaller [388] were for many years closely associated. ... Wendel, though not a writer like...Tieffenthaller, had also something of the geographer in him. A Russian named Czernichef had travelled in 1780 from Bukhara through Kashmir to Lucknow, and Father Wendel interested himself in his experiences, communicating the diary of his travels to the learned Colonel Wilford [396–7] at Benares.

"He himself, in 1764, prepared and sent to the erudite Anquetil Duperron [309–10] a map showing the strategical position of the Mogul and British armies at the time of the battle Buxar. ... He was also the author of a *Memoir on the Land of the Rajputs and Other Provinces to the South and South-west of Agra*, with a Map which he drew up in 1779, ... afterwards presented by Colonel Popham to the famous geographer Major Rennell. These labours of Father Wendel were stated by Rennell[7] to have been most useful to him in the preparation of his own great map of Hindustan"[8].

Thomas Call incorporated a survey of the country north-west of Delhi by "Padries Windell & Tieffenthaller" into his Atlas of India [12, 233].

Amongst the Orme papers are a number of letters from Wendel to Richard Smith, written from Agra, probably between 1767 and 1770, about political affairs[9].

After the death of Tieffenthaler, Wendel remained the sole survivor of the old Jesuit "Mogor Mission" and he also was buried at Agra [388].

WERSEBE, Hermann Martin Christian von. Corps of Hanoverians [99 n.4,383].
b. 1754. d. 21–12–85, Arcot.

Son of Otto Wilhelm von Wersebe, High-court Assessor, and Lord of the Manor, Neuhaus, Hanover.

Having served in the ranks from 1770, became Cornet 10th Cav. 22–4–74; Lieut. 15th Inf. 21–7–81; Capt. shortly after 6–8–84[10].

Arrd. Madras Oct. 1782.

1783, Served with Hanoverians under Fullarton against *poligars* of south peninsula, at capture of Palghāt, and about Tanjore, where "Lieutenants von Wersebe & du Platt [334-5] specially distinguished themselves"[11]. Continued with the army in south as Engr. and Survr.; Fullarton intended to return to Europe overland by Arabia and Egypt taking Wersebe with him as survr., but had to abandon the proposal owing to ill-health, and Wersebe remained in India till his death[12].

His route surveys and map of Tanjore, are quoted by Rennell, Mackenzie, and Schlegel, and are embodied in Faden's published map [98–9, 220, 243].

WHEELER, Thomas Lucas. H M's 100th Foot[13].

Lieut. 8–8–80; Capt. 26–4–83.

1782, with regt. under Humberstone [125]; wounded during retreat from Palghāt in Oct.[14]; Prisoner in Mysore; released March 1784, and survd. march down to Madras [99].

WHITEMAN or WITTMAN, Charles Henray. Bom. Inf.
b. 1745. bur. 1–2–88.

Ens. 10–1–75 ... Capt. 21–6–84.

Obviously of German origin.

m., Jane ——; and permitted [C M. 17–3–79] to take her with him to Bombay.

1772, as cadet, Asst. to Charles Turner on survey of Bombay [147].

1777–8, made unsuccessful attempt to recruit German artificers, on behalf Directors, for Art. Company to be raised in Bombay [C M. 25–6–78, etc.].

WILFORD, Francis. Ben. Engrs.
b. 1750–1. d. 3–9–1822, Benares; M I.

Ens. 21–12–81 ... Invalid List from 26–6–1812 ... Bt Lt Col. 4–6–1814.

No record of parentage, or of arrival in India. It has been suggested (*Commentarius* 526 n.) that he was of Hanoverian or Swiss origin; no confirmation has been found, and name points to his being English, at any rate on the male side.

Bio. note, Blunt.

1781, Appd. cadet at Calcutta on recommendation of Henry Watson [394].

B P C. 13–2–86 (15); Thomas Call records that Wilford had "been in my office upwards of six years", so he was obviously working as dman. in S G.'s office for some time before appt. as cadet [271].

[1] 53 P/1. [2] 57 P/9. [3] Cardew (56 *et seq*); D Dn. 270 (30). [4] Sometimes wrongly shewn as Wills. [5] Wilson, C R. II (106 n). [6] *Ben P & P.* II (13); H M S. 773 (893). [7] *Memoir*, 1793 (vii). [8] Maclagan (141 *et passim*). [9] Orme MSS. 112. [10] Hanover State Archives. Report 5237–38 of 23–12–1938. [11] Wylly (441). [12] Hanover State Archives. Letter 881/82, 2–3–1939. [13] Disbanded 1785. [14] *Late War in Asia* I (467).

April & May 1782, Survd. river channels between Khulna and Dacca[1] [51], and, apparently in Jan. & Feb. 1783, survd. channels from the Ganges, Cossimbāzār, and Jalangi rivers, giving in his journal a most interesting discussion on the silting up of the rivers of Bengal and their possible control [63].

BPC. 6-10-83 [21]; Call describes him as "a Gentleman of the first Geographical abilities in India", and in 1786 writes; "I am much indebted to Lieutenant Wilford...for his assistance in the construction of the Map of India, whose Merit & Zeal I cannot sufficiently applaud. ... He...till lately was allowed about 250 Rupees a month as assistant; the sum is so trifling, and his services so necessary for the continuation and completion of the work, ... that I must humbly intreat your Hon'ble Board will be pleased to restore to him an allowance he so much deserves"[2] [235, 277-8].

Wilford continued in SG.'s office till the end of 1788 [217 n. 4], completing reductions of Call's Atlas, and was then sent up to survey the *zamīndari* of Benares. An account has already been given of the frequent delays he experienced during the survey of the boundaries [43-5], which he spent in the study of ancient Hindu Geography;

"A few years after my arrival in India, I began to study the ancient history and geography of the country; and, of course, endeavoured to procure some regular works on the subject; ... through mere chance, several geographical tracts in Sanscrit fell into my hands; ... they are very scarce, and the owners unwilling either to part with them, or to allow any copy to be made, particularly for strangers. For they say that it is highly improper to impart any knowledge of the state of their country to foreigners; and they consider these geographical works as copies of the archives of the government of their country"[3].

"In the meantime I have given myself up entirely to the pursuit and study of antiquity from the Hindu Books, and I am happy to say that my success has even exceeded my most Sanguine expectations. ... This work, when complete, will make a large quarto volume and is divided into three sections. The first is entirely Geographical; ... The Second is Historical; ... these two sections are nearly finished; the third section will contain the origin and progress of the Braminicate Religions"[4].

1794, Wilford's claim to succeed Kyd as SG. was considered, but it was decided to appoint Colebrooke, his senior in army rank [261].

June 1794, the Benares survey was closed down, but Wilford was allowed to remain there, keeping his allowances, to continue his geographical and historical researches; the Resdt. pointing out, "even in a general and national point of view, the importance of continuing that Gentleman at this place, as well as of the Government affording him such farther encouragement...to prosecute his valuable Researches. ... Considering all Mr. Wilford's attainments in the essential points of an acquaintance as well with the Eastern as the Western languages, joined to the zeal and Ardour that by his former publications he has already shown, ... it seems to me very doubtful whether any person may again...be found so fully competent to do justice to any similar undertaking.

"The new map of the Upper Parts of India, which Lieut. Wilford has procured such ample materials for, at a very considerable expence, ... may also... appear to you...to deserve the attention of Government [234, 397]".

The GG. was fully sympathetic; "The Board are well acquainted with Lieut. Wilford's professional abilities, and with his successful application of them. ... They must also...have obtained a knowledge of his zeal and success in researches into the literature of the Hindoos, particularly their Geography, in which his extraordinary discoveries...may certainly be expected to throw considerable light on the ancient history of India. ... Lieut. Wilford's talents and knowledge of the Greek and Roman, as well as the Sanscrit, languages, render him peculiarly qualified to pursue discoveries of this nature. ... I have no hesitation in proposing...that he be allowed to remain at Benares in his present situation, with an additional allowance of 600 Rupees per mensem"[5].

To the Directors, the Council explained that, "In determining this allowance, we estimated generally the charges he must incur in securing a numerous collection of Books not easily to be met with, and emplying a competent Number of learned Native Assistants"[6].

Wilford remained at Benares for the rest of his life, devoting himself to research, and writing many interesting papers on ancient geography and history, but after a few years he made the unpleasant discovery that he was being imposed upon by his head *pandit*. He gives a full account of this discovery in an essay published in 1805;

"Though I never entertained the least doubt concerning the genuineness of my vouchers, ... I resolved once more to make a general collation of my vouchers with the originals, before my essay went out of my hands. ... I soon perceived, that whenever the word *Swetam* was introduced, the writing was somewhat different, and that the paper was of a different colour, as if stained. Surprised at this strange appearance, I held the page to the light, and perceived immediately that there was an erasure, and that some size had been applied. ... I was thunderstruck. ... I recollected my essay on *Egypt*, and instantly referred to the originals which I had quoted in it; my fears were but too soon realised, the same deception, the same erasures, appeared to have pervaded them".

He found that these forgeries had all been carried out by the *pandit* whose transcripts from the original documents he had trusted implicitly;

"As the money for his establishment passed through his hands, his avaricious disposition led him to embezzle the whole, and to attempt to perform the task alone, which was impracticable. In order to avoid the trouble of consulting books, he conceived the idea of framing legends from what he recollected from the *Puranas*, and from what had picked up in conversation with me. ... Many of the legends were very correct, except in the name of the country, which he generally altered into that of either *Egypt*, or *Swetam*.

"His forgeries were of three kinds; in the first, there was only a word or two altered. In the second, such legends as had undergone a more material alteration; and in the third, all those which he had altered from memory; ... afterwards sensible of the danger of his detection, he was induced to attempt the most daring falsification of the originals"[7].

The "*Essay on Egypt and the Nile*" had been published in 1792, and had attracted the attention of Sir William Jones

[1] B P C. 24-6-82 (22-3) [2] B P C. 13-2-86. [3] *As R.* XIV. 1822, (374). [4] From Wilford. 10-5-91; B P C. 13-6-94. [5] B P C. 13-6-94. [6] B to C D. 18-8-94 (45). [7] *As R.* VIII. 1805 (247-253).

[342], and Wilford writes, "I shall ever lament that I was the cause of Sir William Jones being thus misled like myself. I have shewn that I was exposed to imposition, first, from the nature of my literary pursuits, and, in the second place, from the confidence which I reposed in the integrity of my native assistants, and more particularly my chief pandit. This no longer exists, and of course no similar deception can now take place" [1].

His many essays, from 1805 inclusive, are free from any suspicion of such imposture, but are of interest mainly to students of Hindu philosophy and comparative geography. A remarkable tribute to the value of his researches is made by the African explorer J. H. Speke [2], who says that Wilford's account of the Nile in his essay of 1792 gave him the clue to the source of that river, and testifies to "the substantial correctness" of the ancient Sanscrit account [3].

Wilford's theories propounded from his old Sanscrit books have been described as "hazardous" but, as Father Hosten writes, "Wilford was, no doubt, very bold, but throughout his writings there is a ring of honesty which cannot be mistaken" [4].

Of more immediate value to the geography of India was his *Map of the Countries West of Delhi... to ascertain the track of Alexander* [234] which he completed by 1804. The map was a tremendous advance on anything that had been produced before, and stretched as far as Sukkur and Dera Ghāzi Khān on the south-west, Kābul on the west, and to Chitrāl and Gilgit on the north. For the collection of material he employed a Muhammaddan surveyor for several years [234 287], and in addition to his Hindu books he had a MS. journal of Father Monserrate [357] dating from about 1590 [149, 234 n. 3, pl. 10 n.].

Great interest attaches to Wilford's possession of this MS., which may have been given to him by Tieffenthaler whom he visited at Lucknow in 1784 [388]. Hosten has discussed the possibility of the Calcutta MS. of Monserrate's *Commentarius* having been in Wilford's possession, and comes to the conclusion that though this MS. is scattered with pencil notes [5] obviously made by an English geographer interested in the Punjab, yet, as not one of his many quotations from Monserrate fit the Calcutta MS., Wilford is unlikely to have possessed that copy, and must have made his quotations from another MSS. [6]; this is confirmed by the fact that he presented two volumes of Monserrate's commentaries to the Asiatic Society [357].

1801, Wilford's appt. and allowance as an Asst. in SG.'s office was struck off "as sinecure" [271], and on his protesting that his situation at Benares had met with the approval of the Directors [7] the GG in C. made up his allowances to their former amount, being "desirous of giving every proper encouragement to Capt. Wilford in the prosecution of his literary studies" [8].

1800, became Sec. to "the Committee which took over the management of the Sanscrit College at Benares, and for some years he practically ruled the institution" [9]. Was a regular contributor to the publications of the As. Soc. of Bengal, amongst his essays being ;

As R. III, 1792, *Egypt and the Nile*; VI, 1792, *On Mount Caucasus*; VIII, 1805, *The sacred Isles in the West*, concerning the Hindu geography of India; XIV, 1822, *The Ancient Geography of India*.

J. A. S. B. 1851. *Comparative Essay on the Ancient Geography of India*.

Hosten comments on the wide extent of his learning ; "Where had he obtained his marvellous library from, including scarce Jesuit MSS., and rare old Latin and Greek books on travel and geography" [10] ? [395] ; his contacts with Tieffenthaler and Wendel would explain this.

He never married, but the following extracts from his will tell something of his domestic establishment ; "unto Khanum Sahib, the mother of my children...20 bighas of land on west side of Muhammedan burying ground...near town of Calcutta ; 17 bighas of land at Russapugla, 24-Pargannas ; 20 Bighas of land at Sicrowri near Benares.

Three of his daughters married officers of Ben. Inf. ; but his only son, "Frederick M. Wilford, was born, through the visitation of God, with an Hemiplegy, and hath since his birth been visited with various distressing bodily complaints, such as the loss of the use of his lower limbs...education greatly neglected ; ... of weak understanding" [11].

WOOD Mark. Ben. Engrs.

b. 16–3–50. d. 6–2–1829.

Ens. 7–7–72 ... Col. 26–2–95. Resd. 14–2–93.
SG. Bengal, 1786–8 [260 n. 2].

Grandson of Mark Wood of Largo, Perth, and eldest son of Alexander & Jean Wood. Bro. to Adm. Sir James Athol Wood, KCB., RN. ; Sir George Wood, KCB. ; Andrew, Lieut. RN. ; and Thomas, Mad. Engrs. [398]. 1st cousin to Thomas Wood, Ben. Engrs. [398].

m., Calcutta, 17–5–86, Rachel, dau. of Robert Dashwood ; she d. 1802. Left a son, Mark, b. 11–12–94, who succeeded as 2nd Bart. & dsp. 1837 when the baronetcy became extinct.

cr. Bart. 3–10–1808. MP. for Milborne Port 1794 ; for Newark 1794 ; for Gatton 1802–18.

DNB. ; *DIB.* ; *EIMC.* I (113) ; *Memorials of the Woods of Largo*, by F. M. Montagu, 1863.

1770, Arrd. Calcutta as midshipman in the *Bute* Indiaman; GO. 20–11–70, Appd. cadet to do duty with Engrs.

1775, Fd. Engr. with 2nd. Bri.; 1777, Fd. Engr. with Stibbert's force in Oudh [37]. BMC. 12–2–78, Furl. on sick certificate, " having for two years past been troubled with a severe bilious disorder ".

1779, Invited by the Directors to return to India with despatches, "represented to be of infinite importance to the British Nation. ... Although only returned from India a few months, and the re-establishment of health, as well as many family matters, called for my residence in Britain for a year, ... I was led to acquiesce. ...

"For the greater security of the Despatches, they were pleased to associate in the charge with me, an Officer of the Bombay Establishment whom I never had before seen, and to whose character I was an entire stranger" [12].

Whilst Wood was to travel with his copy of the despatches via Suez, a duplicate copy was sent by Basra, and triplicate copy went by ship round the Cape.

With his companion, James Noland, he left London 24–3–79, and travelled by way of Brussels, through Germany to Venice, and thence via Alexandria and "Grand Cairo" to Suez ; they embarked at Suez, 27–5–79, on a small vessel of the Bombay Marine, and, 8–6–79, anchored in Mocha Roads where they met Chevalier St. Lubin, whose embassy to the Peshwa at Poona had caused alarm, and hastened war with the Marāthas [4].

[1] *As R.* VIII (262) & Teignmouth I (xiv). [2] Memorial obelisk in Kensington Gardens, London. [3] Speke's *Discovery of the Source of the Nile*, quoted by Sastri (xvii, xxxviii). [4] *Commentarius* (526). [5] Hosten asks where specimens of Wilford's handwriting may be found ; possibly amongst Original Consultations with Imp. Records Dept., New Delhi ; BPC. 18–2–1802 (71) bears an excellent autograph. [6] *Commentarius* (526–90 ; 693–702). [7] CD to B. 3–7–95 (148). [8] BMC. 30–7–1801. [9] Blunt. [10] *JASB.* XVIII. 1922. [11] Ben. Wills. 1822. [12] Wood's narrative, HMS. 456 D (241).

They reached Madras, July 2nd, and Calcutta, July 14th. "We were furnished with a very ample credit for the expences of our Journey, but scarcely had we reached the continent of Europe" write Wood, "when my companion assumed to himself the sole charge of the Money".

He had some difficulty in getting payment of his allowances for this journey, and was at pains to explain that he had made nothing out of the sum provided for their expenses; Noland had told the Madras Government "that the nature of the journey did not admit of his keeping any account", and they "desired that the balance he reported to be remaining might be divided betwixt us", but Wood "thought it incumbent upon me to refuse to participate or reap any advantage from the balance;" and urged that he should be paid his legitimate allowances, though "if jolting over the rugged roads in Germany, Stewed during a month in summer on board a dirty Sclavonian boat, or roasted on the desert of Suez and upon the Red Sea—in all of which situations I can avow my living was not much to be envied—can be deemed a proper recompense, I acknowledge I have been most amply rewarded"[1].

During 1780 and 1781 Wood was employed on "a survey of the river and country on the western bank of the Hughly River from Sankrail to Budge Budge, showing sands and soundings at low water etc.", and in the cold weather of 1782–3 he made a survey of Channel Creek [50].

June 1784, he was at Dinapore, employed on the construction and repair of barracks, and three months later was back at Calcutta, "commanding at Manicolly Point"[2].

Some time between 1780 and 1784 he was in charge of surveys of the Hooghly and of Calcutta, on which several Engr. officers were employed. Three maps of this survey are preserved at the BM., two of which seem to have been actually drawn by Wood, and beautifully drawn they are [38, 52–4]

Feb. 1786, Appd. S G., and continued to comd. at Budge Budge, or "Manicolly Point", and to supt. the construction of the barracks and fort there [261]; his time as S G. was uneventful [43, 216, 235–6]. His orders for Burrow's programme of astr. obsns. met with that outspoken gentleman's unqualified disapproval [157, 158, 161, 318].

B G O. 26–11–88, Appd. C E., and on the departure of Kyd and his assts. to the Mysore War at the end of 1790 assumed charge of maps and plans in S G O. [237].

13–2–93, Resd. appt. and sailed from Calcutta with wife and family in the *Busbridge*[3]. During the voyage home reported on fortifications of St. Helena[4]. Soon after his return, consulted by the Directors and had an interview with Lord Cornwallis on the subject of reforms for the Company's army in India[5].

1795, Received by King George III and presented him with an ivory model of Ft. William.

Said to have brought from India £200,000[6], which could certainly not have been acquired during his surveys, nor by virtue of his office as Surveyor General! Purchased the estate of Piercefield, on the banks of the Wye;

Editor of a small book entitled *A Review of the Origin, Progress and Results of the late War with Tippoo Sultaun*, 1800, comprising two letters from friends in India, copies of certain official papers, and a general map.

WOOD, Thomas. Mad. Engrs.
b. 1770. d. 5–8–1800, Arni; M I.

Ens. 14–7–88 ... Bt Capt. 1–6–96.

Bro. to Mark Wood, Ben. Engrs. [*sup*].

m., 1796, Mary, dau. of Maj Gen. Sir Eccles Nixon, and left one dau.

From July 1786, Dman. in S G O. Calcutta [236].

M M C. 14–3–88, allowed 40 pagodas a month as Dman. to C E. Madras[7] [245]; 18–9–90, Permitted to join Centre Army as Engr[8]; still employed as Dman. 1–8–92.

WOOD, Thomas. Ben. Engrs.
b. June 1765. d. 22–1–1834, Calcutta.

Ens. 18–5–85 ... Col. 25–6–1830.

Son of Robert & Anne Wood; 1st cousin to Mark & Thomas Wood [*sup*].

m. 1st., before 1793, ——; m. 2nd., Calcutta, 30–10–1827, Miss Elizabeth Peirce.

Left 5 sons, James & Robert both in Bengal 1831; William; Henry (1817–90), Bom. Engrs.; and George; and 3 daus. Margaret; Jane; and Anne who m. Capt. William Reynolds R N[9].

C B. 4–6–1815.

16–1–83, Appd. Inf. cadet; sailing in the *Vansittart* 11–3–83.

B P C. 18–12–83. Applied, Calcutta, 22–11–83, for tr. to Engrs., "my inclination leading me to serve in the Corps"; sanctioned from 12–11–83.

G O. 15–8–91, Ordered to join the Army in Mysore.

9–10–92, to proceed with Capt. Welsh's Dett. to Assam as Survr., joining at Gauhāti 7–12–92. Commenced survey from the point where Rennell left off near Goālpāra in 1765, and by April 1794, when the expn. was recalled, had completed the survey of the Brahmaputra as far as the mouth of the Dikho, besides making a circuit up to the Bhutān border through Darrang [8, 80–2].

The following are extracts from some of his letters to Colebrooke;

24–10–93, after telling that he is moving up the river with an advance dett., "I have at last got a decision on my allowances, but I could not get those of a Surveyor of rivers; while I am so employed they very generously pay my boats, and leave me to make the best of the rest" [276 n. 1].

"We promise to have a pleasant party, at least it will be so to me, compared with my last year's excursions, in all of which I was solum cum sola; ... Gwahatty is a vile place in my opinion, and I hope never to be there again for any length of time; indeed never to see it until I am on my way down to Bengal"[10].

10–4–94, "Accept...of my sincere congratulations on your becoming Surveyor General [261], an office for which you are so eminently qualified. ... We went to a place called Jorhaut[11]; ... at first it was not thought proper that I should be surveying until we had had a meeting with the Boorah Goosaine, as they are all very jealous of our intentions, & after we had met the Gosaine, in place of surveying, M. & I found ourselves under the necessity of fighting for several days; ... we had only 18 sepoys, however with them we beat our opponents (2000) in two pitched battles in one day, and for two or three days more had a shot at them now and then & regularly offered them battle, which however they declined. We killed about fifty of their best men and one of their Sirdars; the wounded in proportion. On our side they murdered a naique and sepoy, whom they unfortunately

[1] Report to Govt. B P C. 29–5–80 (24). cf. official account I O Maps. MS. (72). [2] B P C. 10–9–84 (17). [3] *C G.* 14–2–93. [4] I O Misc. 43 (60). [5] H M S. 452 (31). [6] Diary of Joseph Farington, II (94). [7] Mack. MSS. lxviii, 1–8–92. [8] ib. lxix. [9] Ben. Wills. 1834. [10] D Dn. 15 (13). [11] Jorhāt, 83 J/1.

got hold of in the jungles, and wounded a havildar and three sepoys, none however dangerously. In this sort of employment M. and I continued until the 2nd of March at Joorhaut, when orders came from Capt. Welsh for our immediate return. ...

"I had surveyed about half the way up to Joorhaut but most fortunately for me, the day we fell in with the Moahmarriahs, my instruments were with the boats. If I had had them with me, I should most certainly have lost them all, for our followers, missing our tracks in the jungles, fell in with our enemy, and were obliged to make a run for it. By this I lost a horse, pistols, etc., and my sice[1] received a wound in the breast from a spear, and an arrow in the back. ... Capt. Welsh was very upset even with our victories as he was in hopes to have persuaded these people by gentle means to acknowledge and receive their former lord and master [81]"[2].

27–4–94, again from Rangpur[3], after regretting the proposals to withdraw from Assam; "If we do move from Rangpore the 1st July, all I shall be able to do previous to that, will be surveying from where the detachment disembarked to proceed to this place, which is the only mode I have of ascertaining its situation; ... to survey the road hence to Gurgaon, formerly the capital, and afterwards to make a particular survey of Rangpore. ... We have not heard anything lately relative to the Moahmarriahs, but had it not been for that cursed order, ... we should ere this have given them another dressing. ... We were all very much disappointed, for besides glory, we expected to have got some prize money. ... As I lay my account with the worst happening, viz. being ordered with the Detachment into Bengal, may I request your interest and application for my being appointed an assistant in your office; ...I believe there is a vacancy in it at present. ...

"I had flattered myself next season to have had it in my power to clear up Major Rennell's doubts relative to the source of the Burrampooter, and I find it totally impossible to obtain any information from the natives to be depended upon [78–80].

"We have here at present a number of Mugloos, subjects of the Munnypoor Rajah [82]. M. & I have had a pressing invitation to go to Munnypoor, and I will thank you to ascertain whether...Government will allow of my going there as surveyor. ... Don't mention a word of it, however, unless Capt. Welsh is positively recalled, as I would much prefer tracing the Burrampooter to any trip of that kind"[4].

The dett. was withdrawn without Wood being able to take obsns. to fix Rungpur or visit Manipur; he returned to Ft. William, and stayed there working on his maps till Jan. 1795 [82].

Feb. 1795, appd. Asst. and Survr. to Symes on embassy to Ava, and prepared a map of the Irrawaddy that was found of the utmost value during the Burmese war of 1824–6 [8, 84, 85].

G O. 8–12–96, "Appointed to the field in room of Lieutenant Mouat", and directed to proceed to Cawnpore, where Craig's army was watching the movements of the Afghan king, Zamān Shāh, who was believed to be meditating an attack on Delhi and Oudh [55–6, 57].

G O. of C-in-C., 29–1–97, ordered "to proceed to the field without delay", but as at the same time he was appd. 4th Asst, in the S G O.[5], he probably remained in Calcutta till Sept. 1798 when he was sent up by river to join the Army as survr., and for the next two years was kept busy on surveys of eastern Oudh [57–9, 64–5, 271]. He writes to the S G. 6–6–99, from Cawnpore, "I will thank you to ascertain, as soon as you possibly can, whether I am to be employed as a surveyor next cold season or not. If not, I shall do everything in my power to get down to you again, for I detest and abominate this station"[6].

At the end of 1799, sent on a survey from Cawnpore, through Bahraich[7], and then along the foot of the hills to Hardwār, and down the Ganges back to Cawnpore [8, 58]. 14–3–1800, reports progress to the S G.; "You mention that I might complete the whole in 64 easy marches, but, my good friend, you was not aware of the manner in which Sir Jas. Craig was to order me to survey the Ganges. Since leaving Hardwar I have measured upwards of 360 miles, and by the time I return to this again, ... it will amount to about 400 miles, besides which, you are to take into account the time that was necessarily employed in examining fords, gauts, etc. ... I wish, my dear Colebrooke, I was once again at Cawnpore; they will never get me to undertake such a job in so short a time, and without any assistance. I assure you on my honour that I would not go through the same again if they would give me a year's allowances. A survey of such an extent ought not to have been begun upon by a single person, in my humble opinion, but allowing it was, more time ought to have been given to him. ... I hope they will compensate for my losses, expenses etc. ... The latter you will easily believe were very heavy, when I had carriage to provide for all the necessary people, and I have had the misfortune to expend one camel, a horse, a perambulator, and worse than all, a theodolite, knocked to pieces by the man falling who carried it. Fortunately I had duplicates of all except the camel. ...

"As I am perfectly tired of my survey, and the weather of late intensely hot, you may suppose I will make the best of my way to Cawnpore, but it is a matter of great doubt with me whether I will be able to continue the survey so far, as the winds blow so strong, and bring such clouds of sand along with them, that I am sometimes almost blinded and suffocated with it.

"If I possibly can I will continue it, ...if not it must just wait until another opportunity"[8].

[1] Groom. [2] D Dn. 15 (25); similar account, Johnstone (35). [3] The old capital of Assam, 83 J/NW. [4] D Dn. 15 (33). [5] B M C. 27–1–97 (45). [6] D Dn. 15 (77). [7] 63 E/10. [8] D Dn. 15 (113).

He wrote from Cawnpore, April 30th., reporting completion of the survey.

It is not surprising that Wood was very disgusted when he found his allowances refused because he had not complied with regulations and sent in copies of his fieldbooks as his survey progressed [197]. "The whole of my allowances have been retrenched by the M. A. G. for a noncompliance with the regulations laid down for surveyors. ... Little did I expect this would have been the case, when for 5 months I was labouring from morning to night. ... To have copied my field books, allow me to assure you, was completely out of my power; ...they consist of at least 128 pages of foolscap paper, written close and small"[1].

Full allowances for the field work were eventually passed, but he was only allowed four months reduced allowances for protraction and mapping, though he did not finish his maps till December 1801. It was not until 1807 that he obtained any further allowances for this period, and he bore much resentment over the matter, Colebrooke writing to Sackville in 1806; "Should you proceed to Allahabad...you might have the advantage of a few lessons with the Theodolite and sextant from Captain Wood, who is a very able surveyor, as well as practical Astronomer. But do not hint that I advised you to apply to him for any instruction of that kind, as we have unfortunately not been upon the best of terms since he left surveying, though I have done every thing in my power to conciliate him"[2].

An account of his later surveys, and a reference to his distinguished career as engineer, will be given in another volume.

In his will he left "to his son James, the house and lands purchased by me of Capt. Duncan Macleod of the Corps of Engineers, and situate in Camac St. in Chowringhee", and to his son Robert "the adjoining estate, now occupied by him [352]"[3]. From these estates the present Wood Street derived its name, making it a most appropriate situation for the headquarter offices of the Survey of India.

WOODINGTON, Charles. Bom. Engrs.
b. 10–3–70. d. 27–1–93, probably in Malabar.

Ens. 27–1–91.
1792–3, on survey in Malabar [131].

[1] D Dn. 15 (119), 24–5–1800. [2] D Dn. 79, 27–8–1806. [3] Ben. Wills 1834.

INDEX

[Surveyors shewn in the Alphabetical List of Biographical Notes are not repeated in this Index].

Abercromby, General Sir Robert (1740–1827); *DNB.*; *DIB.*; 130, 131, 356, 359.
Abu-l-Fazl (1551–1602), Akbar's minister, 133.
Accuracy :—Astronomical Observations, 151–5, 162, 163, 171, 172, 180 :—Maps, 15, 29, 33, 123, 166–7, 223, 226, 227; pl. 11 n. :—Surveys, 2, 34, 98, 103, 183, 184, 226; *v.* Errors.
Achin, Sumatra (*Hobson-Jobson*, Acheen), 16, 47, 48, 327, 345, 390.
Adams :—Maj. Thomas (d. 1764); *DIB.*; 229, 345, 353 :—instrument-maker (d. 1772), 206.
Adam's Bridge, 87, 385.
Adventures, 25, 34, 291–9; *v.* Fighting; Obstruction; Robbery, etc.
Afghānistān, 220, 232–4; *v.* Kābul; Kandahār.
Africa, 377, 397.
Agra, 11, 56, 116, 132, 176, 365, 386, 387; pls. 1, 6, 10, 11 :—Jesuit headquarters, 68, 69, 150, 388, 395 :—Maps, 29, 219 n.2, 222, 227 :—position, 149, 150, 168, 213, 320; pl. 10 n. :—Surveys, 10 11, 12, 35, 36, 56, 57, 149, 339, 379.
Ain-i-Akbari, 67, 133, 148–9, 160, 208 n.4, 319.
Air-conditioned Houses, 392.
Ajmer, 11, 219 n.2, 233, 234, 246; pl. 1, Agimere; pl. 11.
Akbar (1542–1605), Emperor of Delhi, 10, 71, 357 :—Jesuit mission to, 11, 68, 209, 357; pl. 10 n. :—Revenue Surveys, 133–5, 141.
Akbar-nama, 133.
Alexander the Great (356–323 B C.), 76, 207, 220, 232, 234.
Allahābād, 30, 34, 132, 276, 304, 332, 336, 340, 342, 346–7, 384, 400 :—Maps, 227, 229, 365 :—position, 160, 163 :—Surveys, 8, 11, 29, 33, 35, 36, 38, 183, 188, 314, 332, 333, 340, 342, 352, 360.
Allarot, Hugo, cartographer, 209.
Allen, James (b. 1784), asst. revenue surveyor, 109, 284, 286.
Alligator, 364.
Allowances :—Audit delays, 197, 278, 381, 400 :—Bengal, 158, 196–7, 269, 275–8, 371, 372, 396, 399 :—Bombay, 281–2, 379, 380 :—Madras, 278–81, 350, 354–5, 392 :—Military, 275–6 :—Surveyor of Rivers, 274, 276, 277, 398 :—Surveyor General, 260, 274–5, 346 :—S G's. Office, 235–6, 262–3, 277, 396.
Almagest, astronomical treatise, 148, 160.
Almanacs, 156, 174, 268, 316.
Aloffe, John (d. 1745); Sandes, I (44); 51, 363.
Alves, Walter, ship's captain before 1780, 83 n.11.
Amarkantak, Central Provinces, 29, 60, 299.
America :—NW. Coast, 202, 336, 338 :—War of Independence, 383.
amīn (*Hobson-Jobson*, ameen), land surveyor, 134, 135, 138–40, 147.
Andaman Is. (*Hobson-Jobson*), 390, 395 :—Charts, 16, 84, 313 :—Convict Settlement, 50, 346 :—Islanders, 16, 47–9, 313, 328, 346, 390 :—Survey by :—Blair, 5, 47–9, 123, 313, 390 :—Kyd, 5, 43, 48–9, 327–8, 346 :—Ritchie, 2, 16, 17, 45–6.
Anderson, James (1757–1833); Ben. Inf., Hodson; 39, 325.
Andrade, Father Antonio de (1580–1634), 68.
Anicut (*Hobson-Jobson*), masonry dam :—Godāvari, 107 :—Tanjore, 95, 106, 321, 367, 391.
Anjengo (*Hobson-Jobson*, Angengo), West Coast, 96, 125, 176, 334, 343, 346, 360, 367; pls. 1, 9.
Antiquité Géographique de l'Inde, 211, 331.
Arab Geographers, 1, 10, 148, 208, 210, 220; pl. 4.
Arabia, 122, 313, 395.
Arakan :—Coast, 14, 15, 16, 17, 46, 160, 327, 345, 381 :—Kingdom, 223 :—River, 46, 85; pls. 3, 11, 14, 16.
Arcot, Nawāb of, *v.* Carnatic.
Area :—Measurement of, 94, 134, 135, 144, 146 :—of Rennell's Surveys, 2, 213, 226, 228.
Armagon Shoals, *v.* Shoals.
Armenians :—Governor of Narwār, 338 :—Surveyor, 17, 23, 283, 292, 371 :—Travellers, 76.
Arnold, watchmaker, 155, 165, 175, 202, 203, 204, 317.
Arrian, Flavius (*c.* A D. 96–180), Greek historian, 220.
Arsenals, 199, 203, 290.
Artillery :—Bengal, 13, 51, 267, 338, 361, 395 :—Bombay, 3, 120, 267, 273, 324, 333, 341, 348, 393, 395 :—Establishments, 266 :—French, 222, 388 :—Madras, 267, 311, 329, 336, 337, 395 :—Royal, 316, 356, 361.
Artists, 309, 321, 328 n.6, 337 : *v.* Daniell; Hodges; Home; Portraits; Sketches.
Ascoli, F. D. (*c.* 1915), Ben. Civ., 226.
Asiatic :—*Researches*, 73, 154, 162, 175, 361 :—Society of Bengal, 250, 319, 342, 377, 397; pl. 10 n. :—*Journal of*, 357.
Asoka Pillars, 167.
Assam (*Hobson-Jobson*), 73, 78–83, 209, 223 :—Rennell's Survey of frontier, 2, 8, 20, 228, 229, 291, 371, 379 :—Welsh's Expedition, 8, 80–2, 398–9; pls. 1, 14.
Assessment of Revenue, *v.* Land Revenue.
Assistant :—Revenue Surveyors, *v.* Revenue :—Surveyors :—Bengal, 17, 22, 31, 46, 47, 55, 158, 269, 270, 313, 314 :—Bombay, 128, 131, 132, 273, 301, 335, 356 :—Madras, 92, 98, 117 : *v.* European Assistants.
Assistants :—Civil, *v.* Civil :—to Surveyor General :—Bengal, 65, 235–7, 261, 271, 275, 277–8, 309, 314, 327, 328, 339, 397, 399 :—Bombay, 218–9, 357, 379, 380.
Astrolabe, 148, 149, 150, 151, 176, 206.
Astronomer, 376, 388, 400 :—Company's, at Madras, 6, 172–4, 263–4, 268, 337–8; *v.* Goldingham; Topping :—Royal, 153, 155, 316, 384; *v.* Maskelyne.
Astronomical :—Control of Survey, 57, 70, 101–2, 148–81, 166, 207, 210, 213, 240, 232, 234, 376–7; pl. 7 n. :—Observations :—Bengal, 4, 22, 31, 41, 47, 56, 148–68, 182, 185, 186, 222, 314–5, 318, 336, 361–2, 385 :—Bombay, 176–9, 384, 394 :—Jesuit Missionaries, *v.* Jesuit :—Madras, 6, 98, 113, 169–75, 194, 195, 211 n.3, 337, 338, 386, 389, 390; *v.* Observatory :—Computation of, 163, 164, 168, 171, 197, 252, 285 :—Survey of Reuben Burrow, 5, 43, 155–67, 168, 232, 271, 313, 318, 398 :—Positions, *v.* Geographical Positions :—Tables, or Ephemerides, 148, 150, 151, 156, 163, 171, 177, 180.
Astronomy, 157, 270–1, 310, 318, 389; *v.* Hindu.
Atlas of India, ¼-inch, x, 226, 229, 376.
Atlas :—Bengal, *v. Bengal Atlas* :—Call's, 5, 11, 12, 38, 43, 215–7, 232, 248, 253–4, 271, 323, 375, 395, 396 :—*Companion to Bengal Atlas*, 226, 227 :—Kelly's, 3, 97, 240–2, 248, 257, 343; pls. 9, 15 :—projected by Orme, 212.
Attock, 55, 149, 209, 232, 233, 357; pls. 1, 8, 11.
Auditor :—Civil, 230 :—Military, 197, 278.
Aurangābād, 115, 116, 121, 128, 132, 385, 386, 393; pl. 1.
Ava, 8, 15, 82, 83–4, 85, 316; *v.* Burma.
Azevado, Father (1578–1660), 68.
Azimuth, or amplitude, Observations, 151, 152, 165, 170, 175, 188, 191, 193.

Badrīnāth, 72, 78, 161, 286.
Baggage Coolies, 276, 279, 289, 291, 299.
Baghdād, pl. 4 n.

INDEX

Baillie, Colonel Wm. (d. 1782); *DNB.*; *DIB.*; 367 :—'s Disaster, 4, 40, 97, 343, 349, 367, 369.
Baird, General Sir David, Bart. (1757–1829); *DNB*; *D I B.*; 9, 308.
Bake, or Blake, Herman (*c.* 1670), German adventurer, *R E. Journal*, LVIII, March, 1944 (6), 147.
Baker, George, ship's captain *c.* 1750–60, 83–4, 330.
Bakshi, or paymaster (*Hobson-Jobson*), 302, 337.
Balaghāt (*Hobson-Jobson*), 244; pls. 3, 12, Balaguata.
Balambangan I., N. of Borneo, 330, 340.
Baluchistān, 218.
Bamboo :—signal poles, 191, 194 :—groves, 51 :—measuring rods, 134, 165, 166; *v.* measurement :—weapons, 158.
band-o-bast (*Hobson-Jobson*), 135, 137; *v.* Land Revenue.
Bangalore, Mysore, 113, 129, 170, 328, 386; pls. 1, 9.
Bāramahāl (*Hobson-Jobson*, Barramuhul), Salem, 89, 110, 113, 144–5, 193, 273, 314, 369; pl. 9 :—Survey by :—Allan, 111, 193, 244 n.5 :—Mather, 7, 113–4, 194, 265, 354.
Bark, or quinine, 131.
barkandāz (*Hobson-Jobson*, burkundauze), 25, 80, 289, 291, 292.
Barbier, Father, S J. (*c.* 1720), 152.
Barnard, Nicholas (d. 1764), Mad. Engrs., 311.
Baroda, 121, 126, 386; pl. 11, Brodur; pl. 12 :—Gaeckwar of, 123.
Barometer, 158, 204, 205, 362.
Barrack-master, 314, 345, 347.
Barrackpore, 336, 339, 359, 383.
Barren I., 47, 327.
Barros, Jean de (1496–1570), Portuguese historian, 78, 210, 221.
Basālat Jang (d. 1782), 86 n.2, 111, 241; pl. 9 n.
Base-lines, 102, 114, 182, 191, 194, 195, 198, 290, 299.
Bassein, Bombay, 121, 122; pls. 1, 10.
Bath, Somerset, 312, 315, 325, 326, 337, 361, 374–5, 381, 383.
batta (*Hobson-Jobson*), 274–80, 287–8, 343, 360; *v.* Mutiny.
Battalion, commanders of, 40, 273.
Bay of Bengal, 15, 45–7, 123, 152 n.9, 173, 340, 381, 389, 390, 391.
Bearings observed, 96, 97, 99, 104, 111, 184–9, 193; *v.* Compass; Theodolite.
Bears, 25.
Bednur, or Nagar, Mysore, 4, 125, 176, 242, 341, 348, 386, 393; pl. 1, Bednore; pl. 12, Bendor.
Bellary, 110; pl. 9, Bailari.
Benares, 233, 304, 327, 332, 359, 394, 397; pls. 1, 11, Bannara :—Centre of learning, 156, 318, 396; pl. 13 :—District, 35, 44 n.1 :—Observatory, 150, 156 :—position, 148, 154, 160, 326 :—Rāja of, *v.* Chet Singh :—Survey, 11, 35, 38, 42, 43–5, 167, 183, 326, 336, 340, 396.
Bencoolen, Sumatra (*Hobson-Jobson*), 153.
Bengal :—Cession to E I C., 12, 24 :—Maps, 210, 221–31, 373; pls. 13, 14 :—Nawāb of, 1, 24; *v.* Mīr Jafar; Mīr Kasim :—Survey by Rennell, vii, 2, 17–36, 84, 160.
Bengal Atlas, Rennell's, 212, 227–30, 375, 377.
Benning, R. (*c.* 1750), engraver, 93.
Berār, 38 n.5; pls. 1, 11 :—Maps, 246 :—Rāja, *v.* Nāgpur :—Surveys, 7, 38, 59, 116, 118, 309, 314, 379.
Bernier, Dr. Francis (d. 1688), 232.
Bernoulli, Jean (1744–1807); A R., Berlin, 1763; *DIB.*; *Ency. Brit.*; 11 n.15, 72, 214, 310, 315; pl. 6 n.
Berthoud, Ferdinand (1727–1807), Swiss clockmaker, *Ency. Brit.*; 202.
Bertoli, Ferando, cartographer, 208; pl. 2.
Bhīls, 126.
Bhonsla Rāja, *v.* Nāgpur.
Bhopāl, 39; pl. 1, Bopaltol.
Bhutān, 23, 26 n.7, 34, 36, 69, 73–5, 81, 204, 225, 228, 229, 332, 342, 394, 398; pls. 1, 5, 14 :—Mountains, 20, 23, 67, 76, 77, 159, 332, 372 :—Name applied to Tibet, 23 n.5, 74, 75, 210, 223.
Bhutanese, 32, 74, 292, 342, 354, 372.
bigahs, 134, 135, 137, 138.
Bihār, 319, 348; pl. 1, Bahar; pls. 13, 14; *v.* Patna :—Cession, 24 :—Maps, 223, 224–8, 230, 365 :—Survey, 2, 24–7, 29, 33, 332, 333, 353.
Bird :—James (1797–1864), Bom. Med., 220 :—John (1709–56), instrument-maker, *DNB.*; 200 n.5.
"Black Hole of Calcutta", 337, 364.
"Black people", 87, 100, 134, 138, 191, 320, 389.
Blacker, Valentine (1778–1826), Mad. Cav.; S G., 1823–6 : *DNB.*; *DIB.*; 163, 215, 225–6, 272.
Blacktown, Madras (*Hobson-Jobson*), now Georgetown, 94, 103, 311, 314, 341, 348, 353, 363.
Blake, Herman, *v.* Bake.
Blakiston, John (1785–1867), Mad. Engrs., 351.
Blanks on maps, 38, 129, 161, 210, 226, 242, 269; pl. 13 n.
Blechynden, Richard; Calcutta, *c.* 1790–1815, 394.
Board of Revenue, Madras, 143–6, 284–5.
Boats :—accidents, 17, 18, 27, 66, 159 :—building, 392; *v.* Ship-building :—supply, 18, 19, 23, 26–7, 59, 66, 102–3, 109, 283, 324, 371, 372, 381, 398; *v.* budgarow.
Boisseau, Jean (b. *c.* 1760), draughtsman from Pondicherry, 236, 237 n.4, 339.
Bokhāra, 395.
Bolts, Wm. (1735–1808), *DNB.*; *DIB.*; 223, 360 n.5 :—Map of Bengal, 30, 223.
Bombay, vii, 3, 4, 6, 31, 120–32, 147, 176–8, 265, 303 :—Fort & Town, 120, 147, 313, 315, 333, 393, 395 :—Island & Harbour, 3, 120, 126, 147, 378, 393 :—Marine, 6, 42, 123–5, 155, 203, 313, 336, 355, 381, 397 :—position, 154, 160, 176, 177, 178, 181, 338, 340, 384.
Borders of Maps, 225, 226.
Borneo, 83 n.11, 183, 316, 330, 339, 370.
Botanical :—Gardens, Sibpur, 105 n.6, 316, 346–8 :—Survey, 316, 376.
Botanist, 105, 338, 347, 350.
Boundaries :—fixing of, 137 :—on Maps, 54, 225, 242; pl. 1 :—Mysore, 88–9, 119 :—Nizām's territories, 118 :—Survey of, 33, 44–5, 131, 183, 396.
Bourchier, Richard (d. 1770); Governer of Bombay, 1750–60 : 324.
Bourdonnais, Admiral Mahé de la, 93.
Bourzet, cartographer, 99.
Bowyer, R., cartographer, pl. 9 n.
Boyd's *Hirkarah*, Madras newspaper, 392.
Brahmaputra R. (*Hobson-Jobson*, Burrampooter), 19 n.2, 21, 72, 74, 78–80, 209, 223; pls. 1, 3 n., 13, 14 :—Identity with Tsang-po, *v.* Tsang-po :—Journey of Burrow, 158–9, 163 n.8 :—Map of, 229 :—Memoir by Rennell, 79 n.6, 213, 375 :—Survey by :—Rennell, 2, 8, 19–20, 222, 291, 371 :—Wood, 8, 81, 84, 398, 399.
Brāhman :—Assistant at Observatory, 174 :—Maps, 161, 208, 238, 309 :—Learned Men, 150, 156, 158, 160–1; *v.* Hindu.
Brāhmans, 102, 107, 304.
Brathwaite, Sir John; Maj. Gen., 1800; *DIB.*; 96, 367.
Bristow, John (1750–1802); Ben. Civ., 1769; 168, 313, 326.
British Museum, viii, 222, 243, 325, 331, 348, 383; pls. 2, 11, 12, 13, 16.
Brittridge (*c.* 1790), engraver, 313, 388.
Broach, Gujarāt, 3, 121, 147, 378, 393; pls. 1, 2, Baroche; pls. 11, 12, 16 :—*pargana*, survey of, 3, 4, 122–3, 176 n.14, 341, 348, 378 :—Position, 176, 394.
Brœck, Mattheus van den (*c.* 1660), 221, 364.
Brohier, John, Mad. Art. & Engrs.; *R. E. Journal*, March 1944, LVIII (5); 93, 309.
Brown, Archibald (d. 1825); Mad. Inf., 1768; 334.
Browne, James (1743/4–92), Ben. Inf., Hodson; *DIB.*; 295 n.2, 366.
budgarow (*Hobson-Jobson*), 18 n.1, 27, 319, 332; *v.* Boats.
Budge Budge, 52, 54, 261, 325, 346, 361, 398; pl. 14.
Buffalos, wild, 20, 26, 32.
Building construction & repairs, 323, 338, 343, 347, 356, 365, 372, 383, 398.
Bullocks, pack, 289, 301.

Bundelkhand, 11, 27, 29–30, 38, 183 n.3, 221, 222, 348, 360.
Burdwān, pls. 13, Burda ; 14 :—Cession to E I C., 1, 21, 136 :—Maps of, 167, 225, 231, 365 :—Position, 341 :—Survey, 2, 21–2, 225, 227, 333, 365.
Burhānpur, C P., 30, 31, 39, 121, 298, 321, 326, 379, 386 ; pls. 11, 12, Brampore :—position, 176.
Burma, 8, 83–5, 316 ; *v.* Ava ; Pegu.
Burmans, 46, 82, 85.
Burmese Wars :—1824–6 ; 1852–3 ; 82, 85, 399.
Burrard, Sir Sidney Gerald (1860–1943) ; R E. ; ix, x, 260 n.11.
Burrow, Charles (1781–1803), Mad. Inf., 316, 320.
Bussy's marches in the Deccan, 115, 117, 118, 170, 245, 320, 385.
Buxa Duars, 74 n.13, 76 ; pl. 5.
Buxar, Battle of, 24, 28, 341, 353, 360, 395 ; pl. 14.

Cabral, Father John (b. 1599), Wessels, 69.
Cacella, Father Stephen (1585–1630), Wessels, 69.
Cāchār, 82, 83, 151, 223, 364 ; pl. 14.
Cadastral Surveys, 145 ; *v.* Revenue Surveys.
Cadder Beg, 292–3, 372.
Cadets, 90, 156, 266, 273, 325, 342, 344, 366, 380, 381, 382, 386, 387, 395.
Caillaud, General John (1724–1812), *DNB.* ; *DIB.* ; 91, 322, 364.
Calcutta, 12, 160, 318, 327, 337, 342, 347, 359, 361, 364–5 :—Capture of, 1756, 12 n.13, 51, 54, 348 :—Civil Architect, 389 :—Lands, Survey of, 51, 137, 250, 311, 353, 386 :—Large-scale Surveys, 5, 38, 51–4, 65, 250, 270, 310, 314, 382, 394, 395, 398 :—Lottery, 389 :—Maps of, 51, 53–4 :—position, 153, 154, 167, 168, 180–1, 223, 329, 340, 341, 361, 384 ; *v.* Fort William :—Rennell's visits, 24, 262, 371, 372 ; *v.* Surveyor General's Office :—Theatre, 323, 329 :—Views of, 310, 328.
Calicut, Malabar, 86, 123, 125, 130, 179, 308, 332, 356 ; pls. 1, 2, 3, 9, 12, 16.
Calimere Point, 14 n.3, 101, 370, 390 ; pls. 9, 12.
Calmette, Father, S J., 86 ; *v. Lettres Edifiantes*, XIII (360).
Camels, 60, 160, 187, 296, 363, 399.
Campbell : Sir Archibald (1739–91) ; *DNB.* ; *DIB.* ; Sandes II (329–30) ; 101 n.9, 102, 110, 128, 170, 190, 346, 365, 386 :—John (*c.* 1745–70) ; Ben. Inf., Hodson ; 358. :—John ; *Clan Campbell* 143 (1751–1803) or 144 (1754–80) ; 325.
Canals, 93, 105, 335 ; *v.* Irrigation ; Tolly's Nullah.
Canary Is., 242 n.2 ; *v.* Ferro.
Cannanore, Malabar, 7, 130, 178, 356, 357 ; pls. 2, 3, 9, 12, 16.
Cantelli da Vignola, Venetian cartographer, 208, 221.
Canton, China, 173, 181, 330, 338, 340.
Cantonments, 41, 270, 343, 391.
Cape : of Good Hope, 267, 310, 339, 363, 383, 385, 393 n.2, 397 :—Town, 336, 337 :—Verde Is., pl. 10 n.
Capuchin Mission, 69, 70, 75.
Caraccioli, Charles, author, 251, 360.
Carmelite Mission, 86.
Carnac, Colonel John (1716–1800) ; *DNB.* ; *DIB.* ; 345, 348, 360, 371.
Carnatic (*Hobson-Jobson*), 1, 96, 98, 314 ; pls. 1, 9 :—Cession to Company, 7, 107 n.6 ; pl. 1 :—Maps of, 86, 99, 220, 238–40, 241, 242, 322, 344, 383 :—Nawāb of (or of Arcot) :—Dost Ali, 142 :—Muhammad Ali (1717–95), *DIB.* ; 3, 86, 91, 107 n.6, 141, 142, 240, 337 :—Survey of, 87–8, 89–91, 95, 97, 99, 170, 242, 337, 342, 367.
Carpenter, 290, 301.
Carte de l'Inde, by D'Anville, 1, 89, 210–1, 213, 222, 223, 331 ; pl. 13.
Cartier, John (1733–1802) ; Ben. Civ. ; *DIB.* ; 366, 372, 373.
Cash :—Madras coin (*Hobson-Jobson*), 278 n.7 :—supply of, 18, 19, 39, 40, 160–1, 319, 362.
Caspian Sea, 214, 233.
Cassini, Italian astronomers ; four generations at Paris Observatory, Jean Dominique (1625–1712) ; Jaques (1677–1756) ; Cesar Francois (1714–84) ; Jaques Dominique (1758–1845) ; *Ency. Brit.* ; 176.
Catalogue of Maps, 252, 256, 258.
Cathay (*Hobson-Jobson*), 68.
Cathedral, Madras, 321.
Cattle, census of, 142, 146.
Caucasus, or Himālaya, Mountains, 67, 68, 71, 220, 397 ; also Emodi, Imaus, pls. 8, 10.
Cauvery R., 95, 99, 106, 111, 321 ; pl. 9, Cavery.
Cavallo, Tiberius (1749–1809), F R S., *Ency. Brit.* ; 102, 392.
Cawnpore, 58, 160, 163, 399, 400.
Ceded Districts, Madras (*Hobson-Jobson*) :—1792, 113, 244 ; pl. 1 :—1799, 112, 116, 119 n.3, 144 ; pl. 1.
Central :—Asia, 68, 70, 209, 210 :—Provinces, 63, 214 n.1, 363.
Certificate upon honour, 235, 301, 338.
Cession of Territory :—to the E I C., 1, 7, 12, 21, 24, 86, 86 n.7, 91, 107 n.6, 111, 113, 119 n.3, 131, 135–6 ; pl. 1 :—to the Nizām, 116, 119 n.3.
Ceylon, 87, 112, 170, 207, 350, 389 ; *v.* Colombo :—Maps, 238, 239, 244.
Chagos I., 123–4, 313, 335, 383 ; pl. 2, Isole don Garzia.
Chains :—Brass, 205 :—Gunter's, 185, 198, 205, 320 :—Measuring, 182, 183, 189, 198, 206 :—steel, Ramsden's, 165, 166, 194, 198.
Chambal R., 40, 127, 298 ; pl. 10, Samballus f.
Champion, Colonel Alexander (d. 1793) ; *DIB.* ; Hodson ; 224, 315, 365.
Chandernagore, 11, 150, 222, 309, 311, 314–5, 348, 388 ; pl. 13, Sandernagor ; pl. 14.
Channel Creek, Hooghly R., 15, 17, 50–1, 283, 321, 364, 386, 398.
Chaplains, 2, 30–1, 153, 154, 267, 268, 334, 339, 384–5, 393.
Chapman, Charles (1752–1809) ; Ben. Civ., 1771 ; 39, 42, 296, 336.
Charles II, of England (1630–85), *DNB.*, 120.
Charts, marine :—Custody, 66 :—Publication, 15, 221 n.7, 251, 310, 330, 340 ; *v.* Nautical Charts :—Ritchie's, 17, 224.
Chattisgarh, C. P., 60.
Cheduba I., 15, 43, 160, 204, 298, 318.
Chenāb R., 232 ; pl. 8, Chunaub ; pl. 10, Chenao ; pl. 11, Chonab.
Chet Singh, of Benares (d. 1810) ; *DIB.* ; 35, 386, 394.
Chhatarpur, Bundelkhand, 11, 30, 348.
Chiamay Lake (*Hobson-Jobson*), 78, 84, 209, 211 ; pls. 3 n., 11, 16, Cayamay Lago.
Chief Engineer :—Bengal, 31, 36, 50 n.6, 51, 52, 216, 237, 252, 258, 260, 261, 270, 309, 323, 325, 346, 347, 364–5, 394, 398 :—Bombay, 258, 315, 356 :—Field armies, 118, 125, 312, 321 :—Madras, 3, 24 n.5, 87, 88, 92, 100, 112, 173, 175, 239, 240, 244, 247, 251, 252, 254, 256–7, 263, 264, 271–3, 296, 311, 321, 322, 334, 335, 338, 349, 350, 351, 381, 386, 390, 392, 398.
Chilka Lake, 41 n.8, 211, 325.
Chin Hills, Burma, 84 n.4.
China, 40, 68, 74, 84, 85, 100, 166, 210, 223, 237, 330, 341, 348 ; *v.* Canton ; Peking :—Jesuits in, 69, 70, 76 ; pl. 7 n.
Chine, Description de la, Du Haldè, 70, 210 ; pl. 7 n.
Chinese travellers, 208.
Chindwin R., 85.
Chitrāl, 67, 234, 287.
Chittagong, 316, 345, 372, 373, 374, 383 ; pls. 1, 10, Chandekan ; pl. 11, Chatigan ; pl. 13, Shatigan ; pls. 14, 16, Satigan :—Cession to E I C., 1, 21, 136 :—position, 152, 157, 221 :—Revenue survey, 136–7, 138 :—Survey of :—of Coast, 2, 14–5, 46, 65–6, 151, 225, 250, 269, 364, 383, 394 :—of District, 23, 59, 225, 333, 361.
Cholera, 41, 362.
Choromandel Coast, *v.* Coromandel.
Chota Nāgpur, 2, 30, 33, 35, 36, 42 n.4, 225, 228, 294, 324, 326, 336 ; pls. 1, 14 ; *v.* Rāmgarh.

Chowringhee, Calcutta, 51, 53, 65, 168, 262, 347, 363, 400.
Christ's Hospital School, 389.
Chronometers, 46, 124, 158, 163, 175, 176, 177, 181, 190, 194, 202–3, 204, 320, 336, 390 ; *v.* Clocks ; Timekeepers :—Rates of, 159, 162, 166, 171, 177, 203.
Chuars, 294, 300, 326.
Chumalhari Peak, 77.
Chunār, or Chunargarh, 35, 38, 59–61, 167, 202, 229, 314, 323, 327, 353, 359, 361, 365, 394 ; pl. 1.
Circārs, Northern (*Hobson-Jobson*), 309, 320, 329, 390, 392 ; pl. 1 :—Cession to E I C., 3, 24, 91 :—Forde's Expedition, 91, 345, 364 :—Peach's Expedition, 26, 91–2, 329, 330, 337 :—Revenue Survey, 143, 145 :—Surveys & Maps, 3, 59, 61–2, 106, 169, 220, 247, 329, 342, 356, 363, 369, 382, 385.
Circles, reflecting, 199.
Circumferentor, 192, 201, 206.
City Surveys, *v.* Benares ; Bombay ; Calcutta ; Madras.
Civil : appointment held in addition to Military commission, 266, 311, 322, 329, 334, 385 :—Engineer, 51, 266, 272, 309, 338, 363–4 :—Officials, 135–41, 142, 143–5, 272–3, 295 :—Servants :—Establishments & Pay, 136, 138, 275 ;—Surveys by, 92–3, 94, 100, 267–8, 272, 309, 311, 321, 322, 329, 332, 334, 339, 341, 355, 361.
Classification of land & soil, 13, 134, 146.
Clavering, General Sir John (1722–77) ; *DNB.* ; *DIB.* ; 224, 239, 270, 295, 366, 381.
Cleveland, Augustus (1755–84), Ben. Civ., *DNB.* ; *DIB.* ; 37, 162, 366.
Climate, adverse, 2, 3, 6, 106, 113, 274, 284, 312, 325, 333, 342.
Clive :—Edward (1754–1839) ; 2nd Baron ; Governor of Madras 1798–1803 ; 376 :—Robert (1724–74), 1st Baron ; *DNB.* ; *DIB.* ; 2, 266, 322 :—Calcutta, 1757–8, 12, 135, 311, 314, 345, 348 :—'s Fund, 385 :—return as Governor, 1765–7, 2, 19, 22, 24, 365 :—orders Survey of Bengal & Bihār, 20, 22, 25 :—interest in Diamonds, 30, 359 :—'s jāgīr, *v.* Jāgīr :—collection of Maps, 24, 211, 223, 250, 251, 322 :—departure from Bengal, 24, 260 :—Death, 24 n.5 :—Lady, 326.
Clocks, 153, 172, 340 ; *v.* Timekeepers.
Coast :—East, *v.* East :—West, *v.* Malabar :—The, viz. Coromandel, 143, 263, 264, 343.
Coastal Surveys, 2, 3, 13–7, 45–7, 65–6, 101–5, 123–5, 151, 183–4, 190–3, 224, 271, 310, 313, 327–8, 330–1, 336, 338, 339–40, 345, 355–6, 363–4, 381, 390, 392 :—astronomical observations, 151, 152, 157, 176.
Coast-line of India, 151, 152, 157, 176, 210, 238 ; pls. 2, 3, 11 n.
Cochin, 113, 123, 130, 154, 176, 178, 179, 341, 384 ; pls. 1, 2, 12.
Cockerell's march, E. Coast, 43, 395.
Coimbatore, 98, 111, 112, 114, 119, 321, 334, 349 ; pls. 1, 9.
Coldstream, W. M. (1869–1943), R.E. ; 230 n.1.
Colebrooke :—Sir George (1729–1818), 2nd Bart., 45 n.2, 326 :—Sir Henry T. (1765–1837) ; Ben. Civ. ; *DNB.* ; *DIB.* ; 73, 77, 326 :—James (1772–1816), Mad. Inf. ; 326 :—Richard (1800–68), Ben. Inf. ; Hodson ; 326.
Colgong, Bihār, 37, 64, 65, 162, 310, 329 ; pl. 13, Calegam.
Collectors of Districts :—Bengal, 28 n.9, 66, 136, 138–9, 140, 167, 231, 257–8, 266 :—Madras, 7, 107, 114–5, 145–7, 285.
Colombo, 117, 334, 350.
Colours for maps, 54, 87, 111, 146, 225, 237, 242, 243 ; pl. 10 n.
Commander-in-Chief :—Bengal, 261, 262, 274, 311, 326, 344, 354, 359, 362 ; *v.* Clavering ; Coote etc. :—Bombay, 258, 281, 356 :—Madras, 95, 96, 97, 321, 367.
Commentarius, *v.* Monserrate.
Commerce, 73–4, 251, 330, 359, 367, 372–3 : *v.* Trade.
Commissary General's Department, 271, 277, 309, 386.
Committee of Circuit, Madras, 143.
Communications, interior, 1, 14, 17 ; *v.* Distance Tables ; Roads.
Comorin, Cape, 86, 102, 109, 157, 169, 238, 239, 314, 334, 391 ; pls. 1, 2, Capo Cumeri ; pls. 3, 12.
Companion Atlas, *v.* Atlas.
Comparative Geography, *v.* Geography.
Compass (*Hobson-Jobson*, Kumpass), 11, 28, 30, 75, 182, 185, 200–1, 204, 205, 337, 340 :—Azimuth, 50, 100, 177, 200–1, 205 :—bearings, 184–8 :—Pocket, 185, 186, 187, 188, 193, 200–1, 205, 234, 395 :—Variation of, *v.* Variation.
Conjeeveram, Carnatic, 97, 311, 334, 343, 344, 395 ; pls. 9, 12, Congeveram.
Contingent expenses, 235, 276–7, 280, 379.
Contract, payment by, 354–5.
Controlling Committee of Revenue, Bengal, 136.
conucopula (*Hobson-Jobson*, conicopoly), Madras servant, 290.
Convict settlement, *v.* Andaman Is.
Cooch Behār, 23, 35, 36, 69, 74, 225, 227, 269, 292, 342 354, 358, 367 ; pl. 1, Coos Beyar.
Coorg, 7, 113, 130, 131, 346 ; pl. 12, Curiga.
Co-operation between Presidencies, 56, 253–6.
Coote, General Sir Eyre (1726–83) ; *DNB.* ; *DIB.* ; 4, 40, 96, 97, 242, 274, 320, 321, 332, 334, 338.
Copies of :—Maps :—for Directors, 5, 45, 215, 235–7, 245, 250–3, 264, 333, 362, 369 :—forbidden, 262 :—Field-books & Journals, 57, 58, 196–7, 251, 271, 339, 400 ; *v.* Fieldbooks ; Journals.
Coringa Bay, 6, 101, 103–4, 105, 172, 191–2, 385, 386, 390, 391.
Cornwallis :—Charles (1738–1805); 1st Marquess ; *DNB.* ; *DIB.* ; 8, 44, 81 n.14, 118, 141, 144, 160, 161, 261, 273, 345, 346, 398 :—Mysore Campaign, 6, 111, 112, 115, 118, 129, 308, 312, 350, 354 ; *v.* Governor General :—Admiral Sir Wm. (1744–1819) ; *DNB.* ; *Ency. Brit.* ; 5, 48, 49, 327.
Coromandel Coast (*Hobson-Jobson*), viii, 5, 16, 86, 101–5, 110, 157, 164, 166, 190–2, 200, 238, 239, 248, 311, 314, 322, 328, 331, 389, 395 ; pls. 2, 3, 12 ; *v.* East Coast :—danger to ships, 14, 47, 101, 336.
Correspondence, 392.
Correspondent Observations, *v.* Longitude.
Corrupt practices, revenue surveys, 133, 138–40, 144, 147.
Cosby, Col. Sir Henry, (1743–1822) ; *DNB.* ; *DIB.* ; 367.
coss (*Hobson-Jobson*), 10, 40, 76, 151, 247, 387.
cossids, (*Hobson-Jobson*), 42, 286, 303, 304, 336 ; *v. harkaras.*
Cossimbāzār R. (*Hobson-Jobson*), 8, 17, 21, 63, 221, 225, 301, 333, 356, 396 ; pls. 13, 14.
Cotton, General Sir Arthur Thomas (1803–99) ; *DNB.* ; *DIB.* ; 107.
Couchman, Brigadier Sir Harold (b. 1882), viii, x.
Court Minutes, I O., viii.
Courtmartials, 132, 309, 333, 334, 335, 337, 342, 344, 353, 358, 359, 362, 365, 379, 382, 383, 384, 392.
Cow's Mouth, *v.* Ganges R., Source of.
Craig, General Sir James Henry (1748–1812) ; *DNB.* ; *DIB.* ; 57, 352, 399.
Crawford, Charles (1760–1836) ; Ben. Inf., Hodson ; SG. 1813–5 ; 315, 329.
Crawfurd, Dr. John (1783–1868) ; *DNB.* ; *DIB.* ; *Ency. Brit.* ; 316.
Criticisms of :—Rennell's maps, 6, 57, 98, 126, 127, 166–7, 179, 219, 225, 226 :—other surveys, 114, 132, 156, 194.
Crown Library, B M., viii.
Crosthwait, Colonel Herbert L. (1867–1939), C I E., R.E. ; viii.
Cruso, Dr. Thos. (1755–1802) ; Bom. Med., Crawford II (33) ; Crawford's *List* ; 126, 341, 378 n.14.
Cuddapah, 100, 112, 116, 119 n.3, 348, 350, 386 ; pls. 1, 9.
Cultivated land, Survey of, 1, 105–6, 108–9, 133, 139–41, 146–7.
Cursory Survey, 16, 21, 22, 36, 182, 183, 223, 334.
Custody of Maps, 212, 237, 256–9, 327, 382.
Cutch, 132, 246, 287.
Cuttack, Orissa, 28, 30, 39, 42, 153, 199, 223, 294, 296, 304, 309, 325, 332 ; pls. 1, 13, Catek.

Cyclometers, 158, 198.
Czernichef, Russian traveller, 395.

Dacca :—Rennell's survey, 18, 20, 32, 225, 229, 230, 231, 283, 371, 372, 373 :—other surveys, 14, 78, 82, 157, 313, 318, 364, 387, 396 ; pls. 1, 11, 13, 14.
Dalby, Isaac (1744–1824), *DNB.*, 165, 166, 319.
Dalling, General Sir John (*c.* 1731–98); 1st Bart.; C-in-C., Madras, 1784–6 : 99.
dandi, or boatman (*Hobson-Jobson*), 283.
Danes, 338 :—at Nancowry, 16, 48–9, 390 :—at Serampore, 359.
Daniell :—Thos. (1749–1840), F R S. :—Wm. (1769–1837) artists; in India, 1784–93 ; *DNB.* ; *DIB.* ; 73, 78, 328 n.6, 338.
Danish ship, 383.
Dare, Wm. (d. *c.* 1774) ; Ben. Inf., Hodson : 383.
David, Thos. (1783–98), asst. revenue surveyor, 284, 286.
Davidson, Alexander (1740–91) ; Mad. Civ., 1760 ; 173.
Davies,—(*c.* 1620), 120.
Dawson, George (1733–1812), Mad. Civ., 88, 311.
Deccan (*Hobson-Jobson*) : pl. 2 Decam ; pls. 3, 10, 11, 12, 16, *v.* Nizām's Dominions :—Surveys, 7, 115–8, 132, 179, 350 :—Maps, 117, 245, 246, 350 :—Marātha, 6, 128–30, 217, 378 ; *v.* Dhārwār.
De Filippi, Cav. Filippo (1869–1938), 69, 79.
De Meuron, Lt Col. Henry David (1751/2–1804), 97.
Degree :—measurement of, 5, 43, 156, 164–6, 172 n.3, 310, 318–9, 331 :—Squares, 3, 240, 242, 248 ; pl. 9 :—Tables of length, 248.
Delhi, 27, 34, 149, 224, 348, 388 ; pls. 1, 3, 6, 8, 10, 11, 16 :—Emperors of, *v.* Emperors :—Maps, 29, 219 n.2, 221–2, 227, 229, 233, 315 :—position, 148, 149, 224 :—Roads, 10, 234, 386 : pl. 10 n. ; Surveys, 35, 36, 57, 314, 339.
Delisle, Guillaume (1675–1726), French cartographer, 1, 67, 176, 209, 238.
Desert, Great Indian, 219.
Deserters, 40, 324, 336.
Desideri, Father Ippolito (Hippolyte) (1684–1733), 68–9, 71–2, 79–80.
Despatches to & from Europe, 303, 308, 312.
Devicottai, Tanjore, 86, 102, 108–9, 114, 143, 195, 286, 311, 321, 329, 360 ; pl. 9, Divicote.
dewāni, granted to E I C., 24, 91.
Dhārwār, Deccan, 7, 128, 129, 177, 335, 341, 383 ; pl. 1.
dhooli, 300, 301 ; *v.* palanquin.
Diamond :—Harbour, Hooghly R., 51, 313 :—Island, 327–8.
Diamonds, 30, 322, 350, 359, 387 ; pl. 13.
Dindigul, Madras, 7, 113, 114, 146, 285, 286, 349, 334, 382 ; pls. 1, 9.
Dinwiddie, Dr. James (d. 1815), 180, 340.
Directors of the E I C., 318, 348, 379, 384, 385, 391 :—call for :—Economy, 240, 245, 263, 368, 375 :—Maps, *v.* Maps ; Copies of maps :—Surveys, 22, 87–8, 141, 250, 251, 390, 391 :—Members of Court, 308, 326, 332.
Discipline, 40, 343, 353, 362.
Disguise, travelling in, 233.
Dismissal, 256, 262, 277, 324, 330, 333, 334, 340, 342, 353, 358, 383, 392.
Disputes, 173, 272 :—armed, 291, 292–3, 294–5, 297, 298, 379 ; *v.* Adventures ; Obstruction.
Distances :—computed from time, 39, 75–6, 159, 184, 186, 189, 196, 234, 380 ; pl. 7 n. :—along meridian, 20, 152, 183, 192 :—reduced for winding of roads, 10, 184–9, 230 :—Tables, 214, 230 : *v.* Measurement ; Roads.
District :—Maps, Bengal, 231, 257–8 :—Officers, *v.* Collectors :—Surveys :—Bengal, 134, 247 :—Madras, 113–5, 146–7, 193–5, 272, 285–6.
Districts or provinces of Bengal, 227.
doābs :—Definition (*Hobson-Jobson*), 55 n.2 :—Ganges–Jumna, 8, 42, 55, 161, 164 n.1, 228, 229, 232, 345, 361 ; pls. 6, 8 :—of the Punjab, 233 ; pl. 8 :—Tungabhadra–Kistna, 116.
Dockyards :—Bombay, 303 :—Calcutta, 303, 347, 394.
Doctors, *v.* Surgeons :—native, 301.
Dollond, instrument-makers :—John (1706–61), F R S. 1761 :—Peter (1730–1820) & his nephew George (1774–1852), F R S. ; *DNB.* ; 171, 200, 206.
Dorman, Thomas Benjamin (d., Madras, 28–10–87); Mad. Engrs. 1787 (country cadet), 245.
D'Orville, *v.* Orville.
Doncker, Hendrick, cartographer, 209.
Drainage, 65, 321, 391.
Drake, Roger (d. 1765), Ben. Civ., 1737 ; Governor, Calcutta, 1752–8, *DIB.* ; 364.
Draughtsmen :—Allowances, 276, 277, 281, 398 :—Calcutta, 50 n.6, 231, 234–7, 244 n.8, 252, 258, 262, 263, 271, 386, 394, 395, 398 :—Madras, 90, 243, 245, 252, 335, 380.
Draughtsmanship, 229, 236, 245, 317, 321, 354, 369, 370, 384.
Drawing :—of Maps, 143, 226, 234–7, 258 :—materials, 235, 237 :—Paper, 37, 142, 187, 193, 224, 235, 236, 237, 247 :—shrinkage of, 184, 216, 237.
Duels, 309, 337, 342, 344, 358, 362, 384, 394.
Du Haldè, Father (1674–1743), 70, 79, 80, 86, 149, 210 ; pl. 7 n.
Du Prè, Josias (*c.* 1721–80) Mad. Civ. 1752, 89, 90 ; *v.* governors, Madras.
Du Val, Father, 127 n.7.
Dunn, Samuel (d. 1794) ; cartographer ; *DNB.* ; 222, 223, n.8.
Dupleix, Joseph François (1697–1793), *Ency. Brit.*, 1.
Dury, Andrew (*c.* 1770), cartographer, 227.
Dutch, 83, 87, 103 n.1, 123, 153 n.10, 176, 221 :—Maps, 83, 84, 208–9, 221, 223, 238.
Dysentery, 324, 325, 329, 354.

Earnshaw, Thomas (1749–1829); clockmaker ; *DNB.* ; 202.
Earthquake, 1762, 15, 362.
East Coast, 5–6, 14 n.1, 59, 178 :—Cockerell's march, 43 :—Pearse's marches, 4, 40–2, 154–5, 185, 270, 326–7, 334, 340, 355, 362 :—Ritchie's survey, 2, 16–7, 45 :—Topping's survey, 6, 101–5, 160, 170–1, 190–2, 253, 338, 339, 389 ; *v.* Coromandel Coast.
East India Pilot, 169 n.2, 200.
Ecclesiastical Records, I O., viii.
Eclipses of :—Jupiter's satellites, *v.* Jupiter :—Sun or Moon, 149, 150, 151, 154, 156, 168, 169, 176, 180.
Economy, 36, 38, 235–6, 275–6, 276–8, 367–8, 368 ; *v.* Directors.
Education of Officers, 266.
Egypt, 330, 395, 396, 397 ; *v.* Overland route.
Eidington (Edington ?), Colonel James (d. 1800), 111.
Electric Battery, 204.
Elephants :—riding or baggage, 296, 365, 378 :—wild, 20, 32, 220.
Elliot, Alexander Kynynmound (d. 1778) ; Ben. Civ. ; 297 :—Mission to Nāgpur, 30 n.8, 39–40, 325, 394.
Ellore Detachment, *v.* Nizām's Subsidiary Force.
Embankments, 22, 51, 316, 333, 354, 391.
Emperors of Delhi, 10, 11, 24, 55, 121, 127, 133, 234, 301–2, 365, 366, 378, 379, 387 ; *v.* Humāyun, d. 1556 : —Akbar, 1556–1605 :—Jahangir, 1605–27 :—Shāhjahān, 1627–58 :—Aurangzeb, 1658–. . : . . Alamgir II, d. 1759 :—Shāh Alam, 1771–1806.
Engineers :—Chief, *v.* Chief Engineers :—Civil, *v.* Civil :—Military :—Bengal, 2, 52, 53, 261, 266–7, 275, 325, 332, 333, 334, 372, 382, 398 :—Bombay, 258, 266, 273, 281, 333 :—Madras, 173, 266–7, 271–2, 279, 281, 335, 344, 353, 358, 385 :—Aptitude for survey, 29, 267, 270, 273 :—His Majesty's, 101 n.9, 270.
Engraving :—Maps, 15, 27, 53, 87 ns. 3, 4, 88, 123 n.3, 143, 167, 212, 217, 223, 224, 227, 228, 231, 252, 259, 268, 310, 375, 394 :—Marine Charts, 15, 17, 184 :—Views by *Aqua Tinta*, 308, 309, 310, 328.
Epitaph, Michael Topping, 392–3.
Eratosthenes (*c.* 276–196 B C.), Greek geographer, *Ency. Brit.* ; 207, 220.
Errors & inaccuracies, 14, 15, 149, 157, 163, 176, 189–90, 196, 243, 331, 339 ; pl. 10 n. ; *v.* Accuracy ; Criticism.

INDEX

Escorts :—Bengal, 25, 26, 34, 59, 61, 183, 276, 292, 294, 296, 300–1, 323, 326 :—Bombay, 132, 287, 298, 301–2, 379 :—Madras, 96.
European Civil Assistants :—Bengal, 15, 17, 25, 276, 283 :—Madras, *v.* Revenue Surveyors.
Everest, Sir George (1790–1866); Ben. Art.; *DNB.*; *DIB.*; Hodson; vii, ix, 158 n.4, 166, 213, 226, 311 n.5, 368 n.8.
Exact Surveys, 18, 22, 182, 222; *v.* Cursory surveys.
Exchange of Surveys, 216, 218, 379–80; *v.* Co-operation.
Expenses :—Bengal, 13 n.12, 52, 250, 275–6, 277 :—Bombay, 380 :—Life in India, 372–3 :—Madras, 90, 145, 240 :—Map Drawing, 216, 252, 253 :—Map Publication, 212, 227–9, 259 :—Military Expeditions, 91 :—Travelling, 398.
Explorers, Indian, 12, 286–7; *v.* Surveyors.
Eyesight, failure of, 212, 237, 322, 331; *v.* Short Sight.

Fa Hian, Chinese traveller, (*c.* A D. 400), 208.
Factories of E I C., 13, 14, 17, 86, 91, 96 n.1, 120, 153 n.10, 266, 291, 320.
Faden, Wm., cartographer, 39 n.2, 220, 223, 243, 395.
fakīrs, 60, *v. sanyāsi.*
Famine, 106, 159, 372.
fanam, coin (*Hobson-Jobson*), 98, 278 n.7.
Farington, Joseph, 398 n.6.
Farmer, Wm. Samuel (b. 1746), Bom. Civ. 1763, 121.
Farming of land revenues, 136, 138, 141 n.7, 142, 144, 295, 359, 366.
Farquhar, Robert (d. 1778), 39, 325.
Fatehpur Sikri, Akbar's capital, 11, 127 n.1, 149, 357; pl. 5, Fattipour; pls. 10, 11, Fetipore.
Feltham, Robert Owen (d. 1789), Ben. Inf. 1767, Hodson, 293.
Ferro I., Longitude from, 176, 208, 242; pls. 9, 13.
Fever, 18–9, 26, 27, 32, 39, 100, 131, 158, 295, 299, 313, 335, 340, 348, 350, 356, 371, 373, 380, 391, 393.
Fieldbooks, viii, 185–8, 195–7 :—Copies of, *v.* Copies.
Fields, Survey of, 134, 144, 189; *v. ryotwāri.*
Fighting, 23, 130, 341, 398–9; *v.* Adventures; Disputes; Obstruction.
Figure of the Earth, 166, 248.
Fir Trees, 20, 23, 26, 333.
Fireworker, Artillery, 266, 329, 333, 337, 338, 341, 348, 361; *v.* Artillery.
Flags, signal, 189, 190, 192, 194, 389, 390.
Fletcher, Colonel Robert (d. 1776), *DIB.*, 353.
Followers, Establishment & Pay, 276, 289–90; *v.* Lascars.
Forde, Francis (d. 1769/70); *Ency. Brit.*; Ben. Inf.; 91, 339, 345, 364, 399.
Fords, Survey of, 38, 58, 183.
Foreigners :—employment of, 236 :—promotion barred, 333, 354, 365, 369.
Foresti; engineer, Fort William, 1742–4; Sandes, I (46–7); 51.
Forests, or woods, 32, 34, 36, 58, 183, 225, 242, 315.
Forrest :—Arthur (*c.* 1755–1802); H M's. 58th Foot, 1773; Mad. Engrs. 1786; 321 :—Captain Thomas (*c.* 1729–1802); E I C's. Mar. service; *DNB.*; *DIB.*; 45–6, 83 n.11, 202, 336.
Fort St. David, Cuddalore, 110, 304, 311 n.1, 322.
Fort St. George, Madras, 93–4, 311, 329, 338, 340, 363.
Fort William, Calcutta :—College, 250, 337, 340, 359 :—Old, 13, 51, 309, 337, 363, 364 :—New, 13, 333, 337, 365 :—plan of works, 250 :—quarters in, 154, 262, 361.
Forts, Survey of, 51, 87, 89, 92, 110, 112, 116, 183, 261, 314, 315, 385.
Fortnom, John (d. 1779); Ben. Engrs., Hodson: 334, 366.
Fortunes made in India, 269, 322, 352, 372–3, 374, 383, 398.
Fougeron, J., draughtsman, 235.
France :—Institute of, 377, 378 :—King of, 180.
Francis, Sir Philip (1740–1818); *DNB.*; *DIB.*: 39, 134, 141, 224, 303, 345, 359, 362, 365, 381, 394.
Francklin, Wm., (1763–1839); Ben. Inf., Hodson; 301–2.
Fraudulent documents or surveys, 103, 138, 139–40, 147.
Frederick, Colonel Charles (1748–91); H M's. Engrs. 1763; tr. to Bom. Inf. 1771; 128, 177, 335, 341.
Free Merchants, 359, 372.
French :—Capture by, 313, 321, 361, 383, 393 :—in Carnatic, 1, 86, 271, 336, 343 :—in Chandernagore, 372, 388 :—Company under Martin, 353 :—East India Company, 1, 210, 239, 320, 353 :—Geographers, 310, 331, 385 :—in Hyderābād, 91, 117, 175, 320, 350, 385 :—Jesuits, 70 ns. 3, 9, 314 :—Language, 333, 394 :—Maps, 1, 123, 209–11, 223, 239 :—with Marāthas, 393, 397 :—Merchants, 387 :—Survey, 87, 93 :—Surveyors, 1, 221–2, 268, 336, 348, 353–4, 385, 388 :—Wars with, 1, 50, 86, 91, 93, 320, 321, 336, 343 n.10.
Freyre, Father, 68 n.15.
Frisius, Gemma (*c.* 1550), astronomer, 202.
Fryer, Dr. John (d. 1733); F R S.; *DNB.*; 120.
Fulcher, Robert Page (1800–84); Ben. Inf., Hodson; 349.
Fullarton :—Colonel John, 395 :—Colonel Wm. (1754–1808); *DNB.*; *DIB.*; 251, 349, 395 :—marches of, 4, 98, 170, 179, 185, 213, 214, 321, 343, 387.
Furlough rules, 267.

Gabelsberger, Father (d. *c.* 1740), 150.
Gandak R., 17 n.5, 26, 27, 75, 221, 333; pl. 13, Kandoc.
Ganga R., 45, 209, 210, 212; pls. 3 n., 11, 12, 13.
Ganges R., 1, 21 n.12, 167, 211, 220, 233; pl. 10 n. :—Changes of course, 21, 64–5, 229 :—Rennell's memoir, 79 n.6, 213, 375 :—Sources of, 68, 70, 71–3, 80, 209, 363; pls. 1, 6 n., 7 n., 8 n. 21 :—Surveys by :—Jesuit missionaries, 11, 151, 314, 315; pl. 6 n. :—Rennell, 2, 17–9, 21, 23, 222, 229, 247, 371 :—Colebrooke, 8, 64–5, 327, 329 :—other surveyors, 21, 26–7, 37, 58, 163 n.8, 209, 210–1, 225, 316, 333, 338, 340, 399.
Ganges–Hooghly passage, 2, 17–8, 63–4, 329, 339, 396.
Gangotri, Cow's Mouth, 71, 72, 363; pl. 6.
Gardner, Robert (1781–98), asst. revenue surveyor, 284, 285.
Garhwāl, 338; pl. 6; *v.* Srīnagar.
Garo Hills, 2, 19–20, 20 n.1, 34, 83; pl. 14, Garrows.
Garrow, Edward (1751–1820); Mad. Civ. 1769; 173, 390.
Garstin, John (1756–1820), Ben. Engrs., Hodson, 52, 53, 161, 204, 328, 347.
Gastaldi, Giacopo di, cartographer, 70, 208; pl. 16.
Gauhāti, Assam, 8, 80, 81, 83 n.1, 398.
Gazalhatti Pass, Mysore, 111 n.5, 273; pl. 9, Gazle Hatty.
Gent, Wm. (d. 1811); Mad. Engrs. 1772–1802; 244 n.4.
Gentet, Jaspar, cartographer, 238.
Gentil, *v.* Le Gentil.
Geodesy, 376–7, 389.
Geographer to the :—Company, 5, 97–8, 251, 263, 343, 375 :—King, 211 n.7, 220, 223 n.11.
Geographical :—or nautical, Miles, 151, 207, 227 n.4, 247, 248; *v.* Miles :—Positions, lists of, 148, 149, 160, 162, 169, 208, 232, 357.
Geography :—Comparative, 208, 211, 376, 397 :—Father of Indian, 376.
Geometrical Survey, 190, *v.* Trigonometrical Survey.
George III, of England (1738–1820); *DNB.*; *Ency. Brit.* 243, 352, 398.
Gerard, Alexander (1792–1839); Ben. Inf., Hodson; *DNB.*; *DIB.*; 337.
Germans, 115, 383, 385, 395; *v.* Hanoverians.
Gersoppa Falls, N. Canara, 130 n.4.
Ghaggar R., Punjab, 219; pl. 8.
Ghāts (*Hobson-Jobson*, Ghauts), *v.* Western.
Gilgit, Kashmīr, 234, 397.
Gillespie, James, draughtsman, 245 n.1.
Giorgi, Father Antonio (b. 1711), 75.
Globes, 204.
Glossary, revenue survey, 135.
Goa, 10, 12, 129, 335, 341, 387; pls. 1, 2, 3, 9, 10, 12, 16 :—Jesuit hdqrs., 11, 68, 357, 358, 388 :—position, 129, 149, 150, 176, 177; pl. 10 n.

INDEX

Goālpāra, Assam, 19, 73, 77, 78, 79, 80, 157, 159, 318, 398 ; pl. 14.
Godāvari R. (*Hobson-Jobson*), 100, 103, 110, 121, 144, 210 n.8, 239, 321, 348, 369, 390, 391 ; pls. 1, 2, 12, as name of town :—Irrigation survey, 7, 93, 105–7, 173, 321, 335.
Goddard, Thomas (1740–83) ; Ben. Inf., Hodson ; *DNB.* ; *DIB.* ; 35 n.3, 38, 121 :—March to Bombay, 4, 38–40, 121–2, 154, 155, 321, 324, 325, 326, 386, 394 :—Campaign 1779–82, 122, 345, 378, 386, 393.
Godfrey, Samuel (b. 1784), asst. revenue surveyor, 284, 286.
Goes, Brother Benedict de (d. 1607), Wessels, 68.
Gogra R., 11–2, 72, 73, 151, 220, 315 ; pl. 6.
Golam Mohamed, 30, 42.
Golconda, 38, 387 ; pls. 1, 12.
Golding, Wm. (d. 1796) ; Ben. Engrs., Hodson ; 204.
Goos, Pieter, cartographer, 209.
Gorakhpur, 58.
gosain, *v.* Purangir.
Gout, 158, 161, 377.
Governors of :—Bengal, *v.* Drake, 1752–8 ; Clive, 1758–60 ; Vansittart, 1760–4 ; Clive, 1765–7 ; Verelst, 1767–9 ; Cartier, 1769–72 ; Hastings, 1772–3 :—Madras, *v.* Pigot, 1755–63 ; Palk, 1763–7 ; Du Pré, 1770–3 ; ... Pigot, 1775–6 ; Rumbold, 1777–81 ; Macartney, 1781–5 ; Campbell, 1786–9 ; Clive, 1798–1803 ; ... Munro, 1820–7.
Governors-General, 9, 104, 118, 162, 286, 298, 304, 332, 354, 359, 367 ; *v.* Hastings, 1773–85 ; Macpherson, 1785–6 ; Cornwallis, 1786–93, 1805 ; Shore, 1793–8 ; Mornington, or Wellesley, 1798–1805.
Graaf, van den ; Governor of Ceylon 1790 ; 244.
Graham, John, apprenticed surveyor 1816, 244 n.7.
Granary, or *gola*, at Bankipore, Patna, 161.
Grant, Peter Warden (1794–1828) ; Ben. Inf., Hodson ; 85.
Gratuity, to surveyors, 57, 242, 277, 278, 281, 282, 343, 368, 380, 381.
Great Trigonometrical Survey, vii, ix x, 376–7, 389.
Greek Geographers, 1, 207, 220, 397.
Gregory & Wright, instrument-makers, 178.
Grose, John Henry (1750–83) ; Bom. Civ. ; *DNB.* ; *DIB.* ; 120.
Grueber, Father Johann (1623–80), Wessels, 69, 149, 150 ; pl. 7 n.
Guides :—Bombay, 357 :—Captain of, Madras, 4, 95–7, 257, 279–80, 287, 308, 312, 321, 361, 367, 387 :—Corps of, Madras 6, 90–1, 107, 109–11, 118, 272, 311, 337 :—Local, 230, 295, 296, 298–9 ; *v. harkaras*.
Gujarāt, Bombay, 4, 121, 122, 123, 125, 126, 128, 134, 176, 219, 246, 287 ; pls. 2, 3, 12, 16, Guzerate.
gujars, 58.
Gujrāt, Punjab, 71 n.11 ; pl. 8, Gujerat.
Gumti R., Oudh, 29, 221, 295 ; pl. 6, Goomty R.
Gun :—Carriages, 391 :—Foundry, 153, 333 :—Powder, 47, 322, 324, 390.
Guns, 390.
Guntūr Circār, 6, 86 n.2, 111 ; pls. 1, 9 :—Survey of, 99, 107, 111–2, 114–5, 147, 174, 186, 332, 342, 349.
Gurkhas, 75.
Gwalior, 56, 126, 315, 324, 325, 382, 386, 387 :—Māhārāja of, *v.* Sindhia.

H M's. :—8th British Fencibles, 337 :—Regts. of Foot :—14th, 358 :—33rd, 9, 118, 351 :—52nd, 394 :—65th, 335 :—78th, 349, 349 n.6 :—84th, 324 :—97th, 394 :—100th, 99 n.1, 332 :—104th, 394.
Hacke, Wm. (*c.* 1680), cartographer, 221.
Hadley, John (1682–1744), F R S. ; *DNB.* ; 199 ; *v.* Quadrant.
Hahfizee's Map of Gujarāt, 123.
Haidar Ali, of Mysore (1717–82), *DIB.*, 4, 9, 40, 88 n.8, 96, 98, 241, 242, 320, 334, 343, 367, 383.
Hand-printing on Maps, 322, 330.
Hannibal, H M S., 321, 383.
Hanoverians, Corps of, 99, 243, 317, 334–5, 383, 395.
Harbours :—Andaman & Nicobar Is., 5, 16, 17, 46–50, 346 :—Chittagong & Arakan Coasts, 5, 14, 15, 46, 47, 345 :—Coromandel Coast, 6, 101, 103–4, 385, 390 :—Survey of, 370.
Hardwār, 8, 37, 43, 55–6, 58, 71, 73, 77, 157, 219, 314, 338, 359, 399 ; pls. 6, 8, 11 :—position, 160, 161, 162, 163, 234, 318.
harkaras, or messengers (*Hobson-Jobson*), 18 n.5, 25, 38, 60, 89, 95, 96, 110, 230, 240, 241, 262, 276, 286, 289, 303, 304 ; *v. cossids* ; guides :—Reports & Surveys from, 58, 112, 188.
Harris :—General Sir George (1746–1829) ; cr. Baron 1815 ; *DNB.* ; *DIB.* ; 308, 312, 351 :—John ; map publisher *c.* 1700 ; 93.
Harrison :—John (1693–1776), clockmaker, *DNB.*, 202 :—W., engraver, 228 :—Phillips & Harrison, engravers, 1788 ; 243.
Hartley, James (1745–99) ; Bom. Inf. ; *DNB.* ; *DIB* ; 113 n.3, 130, 313, 356, 379.
Hastings :—Marian, 332, 359 :—Warren :—Governor of Bengal, 1772 :—Governor General, 1773–85, 37, 40, 41, 74, 260, 303, 314, 325 n.12, 347, 384, 389, 394 :—Interest in :—Burrow, 156, 157, 162–3, 318 :—Rennell, 212, 224, 227, 228, 274 :—other surveyors, 39, 208, 362, 363, 365, 367 :—permanent settlement, 140–1 :—Trial of, 315, 359.
hast-o-būd, 135, 137, 140.
hāth, 135.
haveli lands, 144 n.1, 391.
Hawke, Lord, Martin Blanden (b. 1744), 344.
Hayter, George, ship's captain 1768–72, 83 n.11.
Heat, 155, 399 ; *v.* Climate.
Height of :—hills & mountains, 20, 23, 34, 83, 124, 244 :—Himālaya Peaks, *v.* Peaks.
Henckell, Tilman (1751–99) ; Ben. Civ. 1769 ; 159.
Herbert :—James Dowling (1791–1833) ; Ben. Inf., Hodson ; 79 :—Wm. (1718–95), hydrographer, *DIB.* ; 211, 304, 331.
Heron, Colonel Alexander ; cashiered 1755 ; 87, 341.
Heyne, Dr. Benjamin (d. 1819), Mad. Med., 350, 376.
Hickey, Wm., diarist, 303 n.6, 328, 347, 383, 384 n.4.
Hijli, Midnapore (*Hobson-Jobson*, Hidgelee), 50 ; pl. 13, Ingeli ; pl. 14.
Hills :—Drawing of, 29, 221, 242, 243, 385 :—Observations from, 142, 190, 193, 194–5 :—Survey of, 124, 185, 186, 187, 188.
Himālaya Range, 1, 67–70, 76–8, 209, 338 ; pls. 5, 6, 7, 8, 10, 14, Bhutan ; Caucasus ; *v.* Peaks.
Hindu :—Astronomy & Mathematics, 56 n.12, 148, 156, 160, 161, 318, 319, 332, 349 :—Geography, 123, 208, 319, 396 :—Literature, 78, 208, 268, 364, 366, 397 ; *v.* Sanscrit.
Hindu Kush Range (*Hobson-Jobson*), 67, 287.
Hindustān (*Hobson-Jobson*), 67.
Hindustani language, 250, 337, 340, 344, 359.
Hirst, Lt Colonel Frederick Christian (1874–1938), Indian Army, viii, 182, 226, 227.
History of :—India, 113, 214, 239, 361, 396 :—Mysore wars, 312, 328–9 :—Orme's, 211–2, 239, 322.
Hiuen Tsiang, Chinese traveller (*c.* A D. 630), 208.
Hodges, Wm. (1744–97), R A. ; *DNB.* ; *DIB.* ; 337, 354, 366, 392.
Hodgson, John Anthony (1777–1848) ; Ben. Inf., Hodson ; SG. 1821–3, 1826–9 ; 72, 163.
Hodson, Major V. C. P., Indian Army, x.
Holkar, Māhārāja of Indore, 126, 334.
Holwell, John Zephania ; Ben. Civ. ; author of *Interesting Historical Events, 1766*, etc. ; 337.
Home, Robert (1711–98), artist, 328 n.5. ; pl. 9 n.
Home farms, Madras, 94, 142–3, 331, 335.
Honāvar, *v.* Onore.
Hooghly R. (*Hobson-Jobson*), 1, 17, 50–1, 53–4, 103, 211, 225, 228, 309, 310, 311, 321, 361 ; pls. 13 n., 14 :—passage from Ganges, *v.* Ganges–Hooghly Passage.
Hook, J. (*c.* 1750), cartographer, 239.
Hooker, Sir Joseph Dalton (1817–1911) ; G C S I. ; botanist ; India 1847–51 ; P R S. 1872–7 ; *DNB.* ; *Ency. Brit.* ; 377.

Horizon, artificial, 162, 168, 171, 175, 177, 200, 205, 206.
Horse Allowance, 94, 279, 280.
Horses or ponies, 26, 60, 61, 62, 130, 299, 322, 323, 339, 354, 359, 363, 366, 398, 399.
Hoshangābād, Central Provinces, 38–9, 326; pl. 1, Hussingabad.
Hosten, Father Joseph, 357, 358, 397; pl. 10 n.
House Rent, 235, 274, 373; *v.* Rent.
Hoxton, John (*c.* 1730), surveyor, 93.
Humāyun (1508–56), Mughal Emperor, 126.
Humberstone, Colonel Thomas Frederick Mackenzie (1753–83), 125, 251, 308, 361:—march from W. Coast, 4, 99, 179, 213, 243, 332.
Hume, assistant to Engineer at Madras 1754, 93.
Hunter, Sir Wm. Wilson (1840–1900); *DNB.*; *DIB.*; 337.
Hurdis, Thomas Bowyer (d. 1808, aged 37), Mad. Civ., 114.
Huydekoper, Johann, cartographer, 209.
Hutton, Dr. Charles (1737–1823); F R S.; *DNB.*; 248, 316, 317.
Hyderābād, Deccan, 7, 43, 61, 91, 115–8, 128, 132, 246, 297, 299, 314, 345, 350, 379, 385, 386, 387; pls. 1, 12:—position, 175.
Hydrographer to:—Admiralty, 330, 331:—E I C., 45, 251, 268, 330, 331:—King, 211 n.12, 268.
Hydrophobia, 60, 339.
Hygrometer, 362.

Ibn Haukal (*c.* 950), geographer, 208, 220; pl. 4 n.
Ill-health, *v.* Sickness.
Imperial:—Library, Calcutta, vii, viii, 221:—Record Department, New Delhi, 357.
Impey, Lady; wife of Sir Elijah (1732–1809); *DNB.*; *DIB.*; 359.
inām lands, *v. jāgīr*.
Index Maps, viii, 33, 224; pl. 21.
India:—House, 22, 212, 251, 309, 343, 374, 375:—Office, viii, ix, 377.
Indiamen, 14 n.2, 16, 317, 330, 383, 386, 393, 397:—Captains of, 45–6, 83, 203, 204 n.5, 205, 317, 328, 330, 332, 339–40, 363.
Indian:—Explorers, *v.* Explorers:—Ocean, 180 n.3, 184 n.2.
Indigo, 77 n.10, 340
Indus, Mihran, Nilab, or Sind, R., 149, 214, 220, 233, 234, 246, 287, 336; pls. 4, 8, 10:—Country adjacent to, 218, 219, 232:—Sources of, 68, 71–2, 76, 209; pl. 8 n.
Infantry:—Establishments, 266, 267:—Officers as Surveyors, 267–8, 269:—service preferred to Engineers, 266, 272, 352, 358.
Ink, drawing, 237.
Inhabitants:—Assistance from, 34, 295–6, 298, 299–300:—Census of, 142, 146:—Objections to Survey, 23, 27, 156, 291–9; *v.* Obstruction:—Timidity, 25, 96, 294.
Inland Navigation, Map of, 214, 229, 230.
Inspector of Revenue Surveys, *v.* Revenue Surveys.
Instruments:—Astronomical, 164–6, 172, 173, 175–7, 198, 199–200, 203–6, 381, 389:—Concealment of, 75, 297, 299:—Cost of, 203–5, 277, 278, 279:—Custody of, 36, 263–4:—Indents for, 203, 205–6:—Mathematical & Survey, 198–206, 398:—Makers of, 206, *v.* Adams, Bird, Dollond; Ramsden; Troughton:—Reflecting, 199–200; *v.* Circles; Quadrants; Sextants:—Sale of, 203, 204, 321, 342:—Supply of, 90, 165, 203–6.
Instructions to Surveyors, 25, 36, 47, 55–6, 59, 65–6, 87, 102, 124, 137, 141–2, 145–6, 152, 157, 182–3, 187–8, 190, 194–5, 261.
Interpreters, 28 n.3, 141, 142, 262, 279, 280, 283.
Intoxication, 44, 319.
Irrawaddy R., or River of Ava, 8, 79, 83–5, 316, 399; pls. 3, 16.
Irrigation:—Channels, survey of, 95, 114, 146, 335:—Surveys, 7, 105–7, 108–9, 192–3, 312, 321, 391, 392.
Islāmābād, Chittagong town, 14 n.8, 23, 66, 152; pl. 14.
Istakhāri, Arab geographer, 220.
Italians, 51, 70 n.1, 208, 389 n.1:—Language, 394.

jāgīr (*Hobson-Jobson*, Jagheer):—Clive's, 136:—*inām* lands, 86 n.2, 133, 135, 137, 366:—of Madras, *v.* Madras.
Jai Singh Sawai II, of Jaipur (1686–1743), *DIB.*; 149–51, 314, 388.
Jaintia, Assam, 83, 227 n.10.
Jaipur, Rājputāna, 10, 11, 149–50, 234, 314.
Jalalābād, 149, 357; pl. 10, Gelalabad.
jama, or *jama-bandi*, (*Hobson-Jobson*, Jumma), 134, 135, 137, 145.
Jantar Mantar, *v.* Observatory, Delhi.
Japan, 338.
jarib, or chain, 134, 135; *v.* Chain.
Jartoux, Father (*c.* 1750), 149.
Jats, country of, 29.
Java, 352, 387.
Jefferys, Thomas (d. 1771), cartographer; *DNB.*; viii, 169, 211, 223, 238, 239, 240, 249.
Jesuit Missionaries, ix, 1, 10–2, 67, 76, 86, 238, 268, 314, 331, 357, 388, 395:—Astronomical Observations by, 1, 5, 11–2, 69, 70, 149–51, 152, 169, 170 n.7, 176, 268, 314–5, 357, 388:—in China, 70–1, 149, 210; pl. 7 n.:—Literature, 397:—Surveys, 10–2, 67–70.
Jesus, Society of, 10 n.7, 12.
Jhelum R., 232 ns.5, 7, 9, 233 n.8; pl. 10, Jehlam.
Jodhpur, Rājputāna, 219; pl. 1.
Johnson, John Ambrose (b. 1779), asst. revenue surveyor, 284, 285.
Johnston, Alexander, senr, (b. 1750), 349 n.7;—Sir Alexander, his son, (1775–1849), *DNB.*, 118 n.2, 349.
Johnstone, George; Mad. Engrs. 1787; dism. 1800; 273, 392.
Journals, viii:—Copies of, *v.* Copies:—maintenance of, 125, 195–7, 278:—Blair, 124 n.1:—Blunt, 60–2:—Burrow, 158–9, 160–3, 167, 316–8:—Colebrooke, 46, 49, 313, 327–8:—De Gloss, 25–7, 333:—Cuttack–Nāgpur, 39–40, 296–7:—Mackenzie, 331:—Rennell, 17 n.11, 18 n.3, 32, 182, 371:—Ritchie, 16, 45, 47:—Smith, 31, 185:—Topping, 191–3, 390, 392:—Upjohn, 66.
Joys, or jewels (*Hobson-Jobson*), 364 n.11.
Jumna R., 116, 127, 209, 210 n.9; pls. 6, 10 n., 11:—Surveys by:—Hoare, 8, 57, 168, 300, 339:—other surveyors, 11, 38, 314, 341.
Junction of Surveys, 169, 183, 195.
Jungle:—Clearing of, 25, 50, 109:—Surveys through, 3, 18, 19, 25, 26, 29, 31, 34, 58, 59, 60, 61, 81, 184, 187, 192.
Jungleterry (*Hobson-Jobson*), 32, 34, 35, 37, 183, 225, 227, 269–70, 295, 366–7; *v.* Santāl Parganas.
Jupiter's Satellites, 59, 81, 149–55, 159, 162, 163, 167–72, 174, 175, 177, 180–1, 320, 389; *v.* Longitude Observations.

Kābul, 55, 68, 208, 233, 234, 397; pls. 1, 2, Cabul; pl. 10; Chabul; pls. 11, 16:—Akbar's expedition, 10, 11, 209; pl. 10 n.;—position, 148–9.
Kailas, or Kentaisse, Mount, 69, 71, 73; pl. 7.
Kālpi, on Jumna, 4, 31, 38, 43, 309, 314, 321, 337, 384, 386.
Kanara, 132, 238, 341, 357; pl. 12; *v.* Sonda.
Kandahār, 148, 149, 214, 232, 233, 344; pls. 2, 11, 16.
Kang-hi, Emperor of China (*c.* 1700), 70.
kānūngos, 12, 133, 135.
Karamnāsa R., the W. frontier of Bihār, 24, 29, 341, 382, 395.
Karens, of Burma, 84.
Kashmīr:—mountains of, 80:—survey of road, 10, 68, 69, 344:—valley of, 67, 74, 133, 208, 209, 232, 233; pls. 1, 8, 10, 21.
Kāthiāwār, 123, 124.
Kātmāndu, Nepāl, 69, 75, 78; pl. 14.
Kearnan, Thomas ( ), Ben. Inf., 394.
Keating, Colonel (1734–80); Bom. Art. 1764; C E. Bombay, 1774; Sandes, II (178, 329); 121, 123.

Kedah, Malaya (*Hobson-Jobson* Quedda), 46, 47, 327, 345, 391.
Kelly :—George Robert Abraham (1773/4–1818), Mad. Inf. :—Hastings Montague (*c.* 1785–1832), Mad. Inf. :—Robert, junr.(b. *c.* 1771), Mad Cav. ; 342, 344.
Kempenfelt, Vice-Adm. Richard (1718–82), R N. ; of H M S *Royal George* ; *DNB.* ; *Ency. Brit.* ; 317, 330.
khalāsi (*Hobson-Jobson*, classy), 189, 289.
Kharda, battle of, 116, 130, 336, 350.
Khasia & Jaintia Hills, 83.
Khōnds, 8, 60, 61, 299.
Khotān, Central Asia, 68.
Khyber Pass, pl. 10, Cayber.
Kidderpore Docks, *v.* Dockyards.
Kinloch's expedition to Nepāl, 75, 347.
kista-būd, 135, 137.
Kistna R., 7, 104, 105–7, 109, 110, 112, 173, 312, 338, 350, 368, 385, 387, 391 ; pls. 1, 9, Kristna.
Kitchen, Thomas (*c.* 1760), cartographer, 211–2, 222, 361.
Klumine, Father, 243.
Kodaikānal Observatory, 173 n.7, 174.
Konkan, along west coast, 121, 122, 238 n.1, 246, 341 ; pl. 10.
Kosi R., 21, 77 n.10 ; pl. 14, Koss, Cosa, Coosy R.
Kulu, 68.
Kumaun Hills, 56, 68, 77, 161, 234, 318 ; pl. 6, Kemaoon.
Kurnool, Madras, 112, 116, 119 n.3, 350.
Kyd :—James (1786–1836) & Robert (d. 1820/1) ; *DIB.* ; shipbuilders ; 347 :—Street, Calcutta, 347.

La Caille, Abbè de (1713–62), astronomer, 310.
La Rochette, L .S. de (*c.* 1780), cartographer, 220.
La Tour, Brion de, cartographer, 211 n.9.
Lacam, Benjamin (1738–1813), engineer, 50, 321.
Laccadive Is., 124, 125.
Ladākh, 68, 69, 71, 74 ; pls. 7, 8, Latac.
Lakes, 84, 85 ; *v.* Chiamay, Chilka, Mānasarawar.
Lakhya R., lower Brahmaputra, 158, 209, 211, 229 ; pls. 13, 14.
Lahore, 148, 176, 214, 232, 233, 234 ; pls. 1, 3, 8, 10, 11, 16,
Lama map of Tibet, 1, 70–1, 72, 73, 209 ; pls. 7, 8 n.
Lambton, Lt Col. Wm. (*c.* 1756–1823) ; *DNB.* ; *DIB.* ; 9, 166, 198, 303, 340, 389 :—Triangulation by, 194, 195, 390.
Land :—Measurement of, *v.* Measurement :—Ownership, 133 :—Records, Director of, 226 :—Revenue ; assessment & settlement, 113, 133–47, 226 ; *v.* Ryotwāri :—exactions of, 133, 137, 138, 140, 144 :—Survey, *v.* Revenue Survey.
Languages, knowledge of, 285, 333, 336, 394, 396 ; *v.* Hindustani, Sanscrit.
Lascars (*Hobson-Jobson*), 25, 102, 195, 276, 279, 289, 290.
Latin motto, 209.
Latitude :—Observations by :—Burrow, 155–67, 186–7, 317, 318 :—Colebrooke, 4, 41, 112, 155, 167–8, 186, 327, 328, 329 :—Monserrate, 11, 149, 357 ; pl. 10 n. :—Rennell, 19, 24, 151–2, 222 :—Topping, 170–4, 190, 191, 192 :—other surveyors :—Bengal, 32, 35, 57, 58–9, 66, 148–68, 185, 186, 206, 340, 358, 384, 395 :—Bombay, 187 :—Madras, 169–70, 174–5, 184 ; *v.* Astronomical Observations :—Parallels of, 248.
Lawrence, Maj Gen. Stringer (1697–1775) ; *DNB.* ; *DIB.* ; 87 :—Memorial...School, Madras, 283 n.7.
Le Gentil, Guillaume (1725–92), scientist, *Nature*, 153 (184) ; 154, 156, 180.
Le Roy, Pierre (*c.* 1750), clockmaker, 202.
Legal value of Rennell's maps, 226.
Leh, Ladākh, 68, ; pls. 7, 8.
Leopard, 372.
Leslie, Mathew (d. 1778) ; H M's. 48th and 76th Foot ; Lt Col. Ben. Inf., 1767 ; 38, 321.
Lettres Édifiantes...(Jesuit), 11, 70 n.9, 238.
Levels, Survey of, 7, 52, 63, 64, 65, 106–7, 146, 192, 194, 290, 389, 391.
Levelling Instrument, 204, 205, 206.
Lewis, Brig. Sir Clinton (b. 1885), R E., x.
Lhāsa, Tibet, 69, 70, 74, 80, 149 ; pls. 7, 14.
Light, Francis (1740–94), *DIB.*, 46, 327 n.3, 390.
Lighthouses, 45.
Lincoln, Henry (b. 1779), asst. revenue surveyor, 284, 286.
Lindley, ——, astronomer, *c.* 1790, 181.
Lines of latitude & longitude, or Map graticule, 223, 239 ; *v.* Meridian.
Little's Detachment with Marāthas, 30, 128, 187, 299, 335, 341.
Livingstone, David (1813–73) ; *DNB.* ; *Ency. Brit.* ; 377.
Log-line, 184, 187, 204.
Logarithms, 349.
Longitude :—Correspondent Obsns. for, 6, 102, 150, 151, 162, 163, 167, 171, 173, 174, 195, 389 :—Method of determination, 316, 317, 319–20 :—reward offered, 151, 154, 162, 202 :—Fundamental ; Calcutta & Madras, 180–1, 223, 244 :—Lines of, *v.* Meridian :—Observations :—Bengal, 59, 81, 149–68, 188 :—Bombay, 123, 178, 340 :—Madras, 101, 112, 169–75 : —errors of, 149, 150, 152, 209, 214 n.4 ; pl. 10 n.
Loss of Surveys & Maps, 83, 94, 100, 119, 183, 227, 231, 252, 256–7, 258, 353, 370.
Lucknow, 29 n.6, 44, 55, 58, 314, 353, 366, 367, 379, 384, 388, 395, 397 ; pls. 1, 6.
Lukiang R., *v.* Salween.
Lunacy, 321.
Lunar :—Observations, 124, 154, 169, 172, 177, 180, 181, 310, 317, 319 ; *v.* Eclipses :—Tables, 151.

Macartney, George, Earl (1737–1806) ; *DNB.* ; *DIB.* ; 99 n.9, 166, 322, 329, 349, 362.
Macfarland, Father J., S J., ix.
Machlin, ——engineer, Madras, *c.* 1770, 94.
Mackenzie :—Collection of Historical Antiquities, 352 :—MSS., viii.
Macpherson, Sir John (1745–1821), Bart., *DNB.* ; *DIB.* ; 347.
Macrabie, Alexander (d. 1776) ; Ben. Civ. ; *DIB.* ; 134.
Madras (*Hobson-Jobson*), 86 :—City Maps & Surveys, 93–5, 341, 355, 383 :—*Jāgīr* :—cession of, 3, 24, 86 :—survey of, 3, 88, 141–3, 169 n.6, 189–90, 227, 239, 244, 272, 285, 311, 314, 322, 323, 331 n.1, 383 : Harbour or roads, 16, 348, 370 :—Maps, viii :—position, 169, 180–1, 331, 348 :—Sieges ; 1746 ; 1758–9 ; 93–4, 322, 330 ; *v.* Fort St. George.
Madura, 86, 87, 90, 98, 321, 334, 341, 349 ; pls. 1, 9, 12 :—Maps, 238, 239, 314 :—Position, 185 :—Siege ; 1763–4 ; 311, 322, 342, 385.
Magee, Wm. notary public, Calcutta, *c.* 1760, 153, 154.
Magnetic :—Observations, 156, 169, 180 n.3 :—Variation, *v.* Variation.
Mahānadi R., Orissa, 22 n.2, 30.
Mahè, Malabar, 123, 125, 178, 308, 309, 329, 333, 342, 343, 367 ; pl. 9.
Makrān, 69, 123.
Malabar :—Coast, 3, 4, 86, 124–5, 130, 157, 178–9, 220, 238, 239, 242, 308, 310, 313, 340, 355, 357, 386 ; *v.* West Coast :—Province, 7, 113, 128, 130–1, 383 ; pls. 2, 12 :—Survey of, 7, 130–2, 178, 298–9, 313, 336, 341, 352, 356, 379, 383.
Malacca, Straits of (*Hobson-Jobson*), 336, 390.
Malays, 327, 390.
Malcolm, Sir John (1769–1833) ; Mad. Inf. ; *DNB.* ; *DIB.* ; 286, 375.
Maldive Is. (*Hobson-Jobson*), 124, 170, 211 n.3, 238, 389 ; pls. 2, 3, 12.
Male Asylum School, Madras, 283, 392.
Malet, Sir Charles Warre (1752/3–1815) ; Bart. ; F R S. ; *DNB.* ; *DIB.* ; 120, 123, 126–8, 130, 297, 299, 378.
mālguzari, 135, 138.
Mālwa, 6, 31, 56 n.16, 126–7, 214, 246 ; pl. 11, Malvay ; *v.* Ujjain.
Mānasarowar Lake, 68, 69, 70 n.7, 72, 80, 209 ; pls. 6, 7, Mapama Talai ; pl. 10, Masarvor.

Mandelslo, John, of Mecklenburg ; traveller *c.* 1630 ; 127, 176.
Manila, Phillipine Is., 117, 329, 330, 350, 370 n.7.
Manipur, or Meckley (*Hobson-Jobson*, Munneepore), 82, 84 n.8, 399 ; pl. 14.
Map of :—*Hindoostan* :—by Call, *v.* Atlas :—by Rennell, viii, 4, 29–30, 126, 127, 212–5, 239, 248, 251, 252, 374, 375 ; pls. 6, 14 :—by Reynolds, 132, 217–9, 246, 248 :—*Punjab*, by Wilford, 234 ; *v.* Punjab.
Maps :—of *India* ; general, 1, 207–9, 219–20, 247, 248, 252 :—by D'Anville, *v.* Carte de l'Inde :—by Monserrate, 11, 68, 209, 357 ; pls. 8 n., 10 :—by Orme, 211–2, 222, 361 :—of *Bengal*, general, 2, 21, 24, 33, 35, 221–31 ; pls. 13, 14 :—of *Bombay*, 246, 372, 379 :—of *Madras*, viii, 238–44, 388 :—for Army, 28–9, 54, 96–7, 110–1, 113, 224, 240–1 :—for Directors, 35, 236 ; *v.* Copies :—Construction of, 183, 248, 252–3, 375 : Custody of, *v.* Custody ;—Drawing of, *v.* Drawing :—Fair Copies, 216, 224, 226, 227 :—Index of, *v.* Index:—Memoirs of 1, 4, 210, 211, 217, 225, 239, 331 ; *v. Memoir* :—of South Peninsula, *v.* Peninsula :—Pictorial, 93, 123 208, 238, 242 ; pls. 2, 3 :—as Private Property, 211, 223, 250–1, 254–5, 256, 258 :—Provincial, of Bengal 33–4, 224–7, 231, 248, 257–8 :—publication undesirable, 127, 224 :—of Punjab, *v.* Punjab :—Reliability, 29, *v.* Accuracy.
Marātha Wars :—1st, 1775–6, 3, 121 n.1, 123, 343 :—2nd, 1778–82, 4, 40, 96, 122, 397.
Marāthas, 6, 7, 24, 34, 38, 40, 55, 60, 113, 121, 128, 296 n.8, 341, 379, 386 ; *v.* Nāgpur ; Peshwa ; Sindhia :—dislike of Survey, 6, 127–8, 297, 298, 393 :—Wars against Nizām, 60, 116, 127, 130, 320, 336, 350, 378.
Marches, *v.* Routes.
Marco Polo, *v.* Polo.
Marine :—Board, Bengal, 65 :—Bombay, *v.* Bombay :—Charts, *v.* Charts, Nautical :—Survey Department, Bengal, 66 :—Surveying, methods of, 183–4, 190 :—Surveyor, Madras, 7, 174, 264, 392 :—Surveyors, 2, 14–7, 45–6, 123–5, 310, 313, 363–4, 381–2, 389 :—Surveys, *v.* Coastal Surveys.
Mariners :—observations by, 1, 151, 184 :—as surveyors, 5, 170 n.6, 175, 267, 381.
Markham's *Memoir on the Indian Surveys*, vii, ix, 331, 347 n.3.
Marriage, amenities of, 322, 373.
Marshall, John, arrd. Bengal 1669, 17 n.5, 67, 76.
Martaban, Burma, 85.
Martin :—Fleming ; Capt. R A. ; Capt. Ben. Engrs., 1764 ; C E. Bengal, 1763–9 ; Lt Col. Ben. Art. 1767 ; 365, 372 n.1.
Martiniere Schools, 2, 269, 354.
Mascall, Joseph (d, 1779/80) ; Bom. Mar. 1772 ; 123, 313.
Maskelyne, Nevil (1732–1811) ; F R S. ; *DNB.* ; *Ency. Brit.* ; 155, 180, 316, 363, 376 ; *v.* Astronomer Royal.
Master Attendant, or Harbour Master, 50, 364.
Masulipatam (*Hobson-Jobson*), 6, 86, 91, 101, 112, 127, 170, 206, 249, 310, 311, 329, 342, 345, 347, 383, 385, 387, 389, 390, 391, 392 ; pls. 1, 3, 9 :—position, 101, 171, 175, 181, 340 :—Surveys, 3, 92, 106, 107, 110, 143, 244, 312, 321, 335, 348, 356, 383, 386.
Mathematics, 155–6, 157, 165 n.1, 189, 268, 270–1, 316–20, 349, 383, 388, 389, 393.
Mathews, Brig. General Sir Richard (d. 1783), 125, 348, 378, 386.
Maule, George (d. 1793) ; Mad. Engrs., 1770 ; 173, 205, 350, 382.
Mauritius, 321.
May, John Stuart ; Supervisor of Nadia Rivers, *c.* 1830, 21.
McCarthy, Jeremiah, marine surveyor, 65.
Measurement : of distances, pl. 7 n. ; *v.* Distances ; Roads :—of land, 134–7, 142–4 :—by rods or ropes, 10, 134, 165, 191.
Meckley, *v.* Manipur.
Medical :—assistance, 26 :—Certificates, 267, 311, 323, 336, 397 :—Officers, *v.* Surgeons.
Medicines & Drugs, 158, *v.* Bark.
Medows, General Sir Wm. (1738–1813) ; *DNB.* ; *DIB.* ; 112, 308.
Megasthenes, Greek geographer (*c.* 300 B C.), 207.
Meghna R., 15, 19, 152, 157, 222, 229, 364, 371 ; pl. 14.
Memoir of a Map of Hindoostan, Rennell's, viii, 212–5 ; pls. 1, 21.
Memoirs of Map Compilation, *v.* Maps.
Mercator, Gerard (1512–94), cartographer, *Ency. Brit.*, 208–9 ; pls. 3, 11 n.
Mercury, *v.* Quicksilver :—Planet, transit of, 150.
Meridian :—distances, *v.* Distances :—map lines, 180, 183, 193, 223, 225, 229, 239, 248 ; pls. 5 n, 10 n, 13 n, 16 n :—location of, 316.
Meru, Mount ; of Hindu geography ; 208.
Meteorological observations, 154, 174, 311, 327, 361–2.
Micrometers, 200.
Midnapore, 41, 395 ; pl. 13, Medinapur ; pl. 14 :—cession to E I C., 21, 24 n.8, 136 :—District, 386 :—position, 152 :—Revenue Survey, 137 :—Surveys, 21–2, 28, 32, 33, 35, 225, 227, 294–5, 300, 308, 323, 333, 336–7, 345, 360, 365, 366.
Military :—Commanders, denied control of Engineer surveyors, 272–3 :—Establishments, 266–7 :—Maps & Surveys, *v.* Maps for Army :—Routes, *v.* Route Surveys :—Service, amenities of, 355, 392.
Miles :—English Statute, 228 n.6, 247, 248 :—Geographical or nautical, *v.* Geographical.
Minicoy I. (*Hobson-Jobson*), 124.
Mīr Jafar (1691–1765), Nawāb of Bengal, *DIB.* ; 12 n.7, 135, 136 n.3.
Mīr Kasim (d. 1777), Nawāb of Bengal, *DIB.* ; 21 n.7, 24, 136, 345, 353, 388.
Mirza Mughal Beg, surveyor, 234, 287.
Missionaries, Jesuit, *v.* Jesuit.
Mitra, Rai Sahib A. K., (b. 1880) Survey of India, viii.
Mogili Pass, *v.* Mughli.
Mogol, *v.* Mughal.
Moll Herman (*c.* 1720), cartographer, 78, 209, 211.
Molucca Is., 348.
Monkeys, 16.
Mons Imaus, or Himālaya, 67, 220 ; pls. 8, 10.
Monserrate's :—*Commentarius*, 149, 232, 357, 397, pl. 10 n :—Map of India, *v.* Map.
Monson :—Colonel George (1730–76) ; *DNB.* ; *DIB.* ; 31 n.1, 224, 381, 384 :—Brig. General Hon. Wm. (1760–1807) ; H M's. 76th Foot ; *DNB.* ; 334.
Monsoon, or Rains (*Hobson-Jobson*), 16, 18, 20, 26, 37, 41, 47, 101, 104, 109, 125, 128, 157, 160, 165, 279.
Montgomerie, Duncan (1789–1878), Mad. Cav., 111, 114, 194, 308, 361.
Moor, or Muhammadan (*Hobson-Jobson*), 300.
Moor's *Operations of Capt. Little's Detachment*, 129–30, 341.
Morgan, Charles ; H M's. 5th Foot, 1762 ; Capt. Ben. Inf., 1765 ; ret. 1800 ; 122, 386.
Mornington, Lord (1742/3–1819) ; later Marquess Wellesley (*qv*), 8, 264, 308, 312 ; *v.* Governor General.
Mosquito net, 162.
Mostyn's Embassy to Poona, 121, 393.
Mount Dilli, Malabar Coast (*Hobson-Jobson*, Delly, Mount), 123, 131, 178, 333, 340.
Mountains, *v.* Himālaya ; Hills.
Mountford, Francis (1790–1824), Mad. Inf., 132.
Mughal Empire, also Mogol, Mogolistan, 22, 79, 221 n.6 ; *v.* Emperors.
Mughli Pass, 111 n.5, 312 ; pl. 9.
Multan, 234, 287 ; pls. 3, 4 n., 11, 16 n.
Munro :—General Sir Hector (1726–1805) ; *DNB.* ; *DIB.* ; 4, 96, 329, 343, 367, 386 :—Sir Thomas (1761–1827) ; Bart. ; Mad. Inf. ; *DNB.* ; *DIB.* ; 144.
munshis, on survey, 38, 286, 287.
Murāng, Nepāl, 23, 67, 76, 225, 228 ; pl. 14, Morung.
Murder & violence, 60, 62, 80 n.6, 309, 345 n.8 ; *v.* Disputes.
Murshidābād (*Hobson-Jobson*, Muxabad), 12, 64, 135, 162 n.4, 228, 293, 309, 345, 348, 358 ; pls. 1, 13, Moosudabad ; pl. 14.
Musical talent, 392, 393, 394.
Musk-deer, 76.
Mutiny :—*batta*—, 1766, 25 n.1, 275 n.7, 336, 340, 347, 352, 353, 356, 360, 365 :—other, 343, 353, 355.

Mysore, 86, 88, 119 n.3, 238 ; pl. 1, references ; pl. 9, Maissur ; *v.* Haidar Ali ; Tipu :—Boundary, 89, 194, 314, 387 :—Commissioners of 1799, 9, 119, 264, 352, 355 :—Survey, 9, 86, 112–3, 114, 119, 179, 187, 239, 254, 352, 354, 355, 376 :—Wars :—1st, 1767–8, 89, 91, 311, 322, 337, 342, 358 :—2nd, 1781–4, 4, 40, 41, 96–9, 125, 311, 321, 334, 335, 338, 349, 352, 362, 367 :—3rd, 1790–2, 6–7, 43, 110–1, 112–3, 115–6, 128–30, 165 n.4, 173 n.1, 179, 214, 237, 253, 287, 308, 309, 312, 313, 334, 346, 348, 349–50, 354, 356, 361, 369, 375, 386, 398, :—4th, 1799, 9, 118–9, 308, 312, 334, 337, 350, 357, 361, 383, 387.

Nadia, or Krishnagar, Bengal, 21, 63, 158, 165, 319, 329, 354 ; pl. 13, Nudia ; pl. 14, Nuddea.
Nāgpur, 6, 29, 39, 42, 394 ; pl. 1 :—or Berār, Rāja of, 4, 24 n.8, 38 n.5, 40, 59, 127 n.11, 294, 296, 384 :—Routes to, 296, 301, 325–6, 332, 337 :—Surveys by Ewart, 4, 42, 155, 286.
Names :—of Places, 34, 187, 196, 209 n.6, 211, 214, 215 n.3 :—Spelling of, *v.* Orthography.
Nancowry Harbour, 5, 16, 48–9, 328, 346, 390 ; *v.* Nicobar Is.
Napier, John, of Merchistoun (1550–1617) ; *DNB.* ; 349.
Napoleon Bonaparte, 375, 376.
Narbada R., 30, 31, 38, 127, 155, 246, 315, 379.
Narcondam I., east of Andaman Is., 16, 46, 47.
Nawāb of :—Arcot or Carnatic, *v.* Carnatic :—Bengal, *v.* Mīr Jafar ; Mīr Kasim.
Nasir-ud-din, astronomer, 148.
Native :—or Indian-born, Assistants, 283 n.8, 283–4 :—Followers, *v.* "Black People" : *khalāsis* ; Lascars :—Surveyors, *v.* Surveyors, Indian.
Natives, *v.* Inhabitants.
Natural Families, 311, 320, 323–4, 326, 336, 344, 345, 347, 352, 355, 364, 367, 393.
Nautical :—Charts, 45, 330–1 ; *v.* Charts :—Miles, *v.* Geographical :—Surveys, *v.* Coastal Surveys :—Tables, 169, *v. East Indian Pilot.*
Naval Officers, 5, 12–3, 48, 269, 271, 338–9, 358, 369, 370.
Navigable Rivers, 13–4, 17, 51, 229, 230.
Navigation :—Dangers of, 157, 386 ; *v.* Shipwrecks :—Instructions & Guides, 14–5, 45, 46, 124, 174, 252, 364.
Negapatam, 4, 98, 103, 239, 339, 342, 343, 360 ; pls. 1, 3, 9, 12.
Negrais, Cape, Burma, 46, 83, 327, 328.
Nellore, 41, 97, 100, 111, 112, 155, 186, 322, 349, 395 ; pls. 1, 9.
Nepāl, 8, 23 n.4, 67, 69, 70, 75–6, 208, 337, 345, 347 ; pls. 1, 14 ; *v.* Kātmāndu.
Neptune Orientale, atlas, 14, 15, 310.
New Guinea, 355.
Nicobar Is., 48–9, 327, 370, 390 ; *v.* Nancowry :—Survey of, 2, 16, 43, 328, 346.
Nieburh, Carsten ; Map of Bombay, 1764 ; 120.
Night marches, 41, 61, 184, 187, 304.
Nizām Ali, of Hyderābād ; assumed rule, 1761 ; d. 1803 ; *DIB.* ; 61–2, 91, 112, 115, 116, 128, 337 :—Army, 7, 116, 118, 130, 336, 350–1, 386 :—Subsidiary Force, 7, 112, 115–7, 175, 245, 349, 350, 361 :—Territories, 61, 115–8, 297, 299 ; pls. 1, 9 :—maps of, 115–7, 170, 245.
Noel, Father Francesco (*c.* 1700), 86, 176.
No(w)land, James (1740/1–80) ; Ben. & Bom. Inf. ; 397–8.
Northern Circārs, *v.* Circārs.
Noti, Father S., S J., 150.
Nutt, Justinian, ship's captain 1779, 204.

oarts, or palm groves, 147.
Observation post, 343.
Observatory :—Benares, 150, 156–7, 311, 318 :—Colaba, 176 n.11 :—Delhi, Jantar Mantar, 150, 314 :—Jaipur, 150, 314 :—Madras, ix, 6, 104, 167, 172–4, 181, 195, 268, 338, 390, 391, 392, 393 :—Greenwich, 180–1 :—Muttra, 150, 388 :—Paris, 150, 315 :—Peking, 70, 149 :—Petrie's, 6, 102, 171–2, 338, 389 :—Samarqand, 148 :—suggested by Burrow for Calcutta, 162–3 :—Ujjain, 150, 151.
Obstruction to surveyors, 32, 109, 118, 131, 140, 142, 158, 159, 291–9, 300 ; *v.* Adventures.
Ocean Currents, 376, 377, 389, 390.
O'Halloran, Joseph (1763–1843) ; Ben. Inf. ; *DNB.* ; *DIB.* ; 309, 384.
Onore, or Honāvar (*Hobson-Jobson*, Honore), 125, 238, 378, 393 ; pls. 1, 3, 9, 12, 16.
Oodua Nullah, *v.* Undwah.
Ordnance :—Board of, London, 156, 166, 317 :—Master General of, 317 :—Survey, 165 n.1.
Orissa, 2, 22, 24 n.8, 28, 30, 33, 38, 40, 314 ; pls. 2, 3, 11, 12, 13, 14, 16 ; *v.* Cuttack :—Coast, 15, 101, 340.
Orme MSS., viii, 395.
Ornamentation on Maps, 385, *v.* Maps, pictorial.
Orphan Asylum, *v.* Male Asylum.
Orrery, model of solar system, 204.
Orthography, 239, 248–50, 333, 337, 342.
Orville, Albert d', Father (1621–62), Wessels, 69, 149 ; pl. 7 n. ; sometimes D'Orville.
Ottewill, W. T. (d. 1940), viii.
Oudh, 2, 55, 57, 224, 352, 388, 397 ; pls. 1, 6 :—Maps, 222, 227, 229, 232, 365 :—Survey :—of Boundary, 44–5 :—under Polier, 2, 33, 34, 352, 354, 365, 381 :—other, 8, 11, 35, 36, 37, 55, 58, 183, 316, 399 :—Wazīr or Nawāb of, 24, 33, 34, 55, 58, 269, 315, 347, 352, 354, 360, 365, 366 ; *v.* Shuja-ud-Daula (1731–75) *DIB.* ; Asaf-ud-Daula (1775–97) ; Saadat-Ali Khān (1797–1814).
Overland route, to and from Europe (*Hobson-Jobson*), 233, 303, 308, 312, 337, 341, 363, 369, 381, 395, 397.
Ovington's Map of Bombay, 120.

Pagoda :—gold coin, 278–81, 385 :—temple, 84, 195, 392 ; pl. 7 n.
Palāmau, 35, 36, 225, 228, 276, 294, 324 ; pl. 14.
Palanquin (*Hobson-Jobson*), 28, 39, 94, 185, 186, 228, 279, 280, 289, 304, 351, 371, 379.
Palghāt, Malabar, 4, 98, 99, 112, 125, 130, 131, 178, 179 n.1 321, 341, 343, 349, 395.
Palk :—Rev. Sir Robert (1717–98) ; Bart. ; Governor, Madras ; *DNB.* ; *DIB.* ; 87 n.9, 322, 370 :—Papers, 344 :—Strait, 87 n.9, 102, 178, 385, 386.
Palmer, Wm. (1740–1816), Ben Inf., 56.
Palmyras Point, 14 n.3, 17, 45, 157, 167, 229 ; pls. 3, 10, 11, C. das Palmas ; pls. 12, 13.
Palnād, Guntūr, 97, 107, 110, 116, 193, 311 ; pl. 9.
Pāngal, Nizām's Dominions, 116, 129, 386.
Panoramas, 49 n.7, 186, 187, 188, 328.
Paper :—Drawing, *v.* Drawing :—Tracing, 45, 236–7, 252.
pargana :—battalions, 267, 300 :—limits, 27, 33, 37, 135 :—survey of 134, 136, 137, 146, 231.
Paris, 310, 315, 387.
Park, Mungo (1771–1806), explorer, *DNB.*, 377.
Parker, Vice-Adm. Sir Hyde (1713–82) ; R N. ; Bart. ; *DNB.* ; 370.
Parliament, Members of, 308, 311, 322, 326, 329, 337, 382, 394, 397.
Parole, 383.
Parsis, 309.
partāl, or check measure, 139–40.
Passes, Survey of :—Bengal, 1, 2, 25, 225, 326, 340, 341:—Madras, 89, 97, 109, 110, 113, 240, 241, 308, 312, 314, 346, 352.
Passports, or *parwānas*, 59, 127, 128, 296, 297, 299, 379.
Pathans, 29, 39, 299.
Patna (*Hobson-Jobson*), 17 n.5, 24, 69, 76, 221, 222, 225, 294, 318, 345, 360, 364, 382, 387, 388 ; pls. 1, 13, 14 :—position, 149, 157, 158, 161 ; pl. 10 n :—Massacre, 309, 345 n.8.
Pay, *v.* Allowances.
Paybills, 278.
Paymaster General, 59, 268, 275.
Peach's campaigns, ; *v.* Circārs.

Index

Peaks :—Himālayan, 76–8, 159, 332, 334 :—Height of, 77, 326.
Pearse's marches, *v.* East Coast.
Pearse, Thomas Deane Mahomet, son of Col. T. D. Pearse, 363.
Pedometer, 75.
Pegu (*Hobson-Jobson*), 14, 46, 84–5, 103, 340 391 ; *v.* Burma.
Peking, China, 1, 69, 149.
Pemberton. Robert Boileau (1798–1840) ; Ben. Inf. ; *DNB.* ; 352.
Penang, or Prince of Wales' I., 5, 46–7, 50, 171 n.5, 327, 345, 346, 359, 386, 390.
Pendulum, length of, 169.
Peninsula, South :—Maps of :—by Rennell, 179, 214, 243–4, 253, 375, 390 :—by D'Anville, 89, 210, 239, 240 :—by others, 1, 3, 179, 211 n.9, 222, 238, 239, 241–3, 243–4, 387 ; pls. 9, 15 ; *v.* Atlas, Kelly's :—Width of, 178–9, 304.
Penna di Billi, Father Francesco Orazio della (1680–1747) 70.
Pensions, 2, 36, 237, 260, 267, 268, 331, 339, 355, 373, 374, 375.
Pentagraph, 89, 204, 205.
Pepper, 346.
Perambākham disaster, 40 n.7, 367 ; *v.* Baillie.
Perambulator, or wheel, 57, 75, 99, 100, 183, 184, 188, 189, 192, 198–9, 204, 205, 206, 380, 399 :—Damaged, 41, 98, 198, 199, 334 :—Madras pattern, 97, 199, 327 :—Traverse, *v.* Traverse.
Pereira, J. V. (*c.* 1800), draughtsman, 284.
Permanent Settlement :—of Bengal, 8, 140–1, 144, 226:—suggested for Madras, 145.
Persia, 69, 123, 233, 337, 375, 387 :—mission to, 286, 375.
Persian :—Geographers, 10, 148, 220 :—Gulf, 310, 313, 337 ; pls. 2, 4 :—Language, 249 :—Secretary or Interpreter, 332 :—Map, 233, 333.
Peshwa, 6, 115, 116, 121, 126, 127, 204, 336, 378, 397.
Petrie, Wm. (d. 1816) ; Mad. Civ. ; *DIB.* ; 102, 171–2, 338.
Philosophical Transactions, *v.* Royal Society.
Physical Geography, 226.
Pigot, George (1719–77) ; Baron ; *DNB.* ; *DIB.* ; 16, 143, 256, 303, 325 n.13, 330, 341, 382 ; *v.* Governor, Madras.
Pilots on Hooghly R., 50, 51.
Pioneers :—Bengal, 333, 365 :—Bombay, 7, 132, 273, 356, 357 :—Madras, 348.
Pīr Panjāl, mountain range, 68.
Pirates, 125, 390.
Pitt, Thomas (1653–1726), Governor of Madras, 1697–1709 ; grandfather of Wm. Pitt, 1st Earl of Chatham ; *DNB.* ; *Ency. Brit.* ; 93.
Pittman : C. H. S., Bom. Inf. (?), 363 :—Gibbon Charles George (1773–98), Mad. Engrs., 363.
Planetable, 113, 193, 263.
Plassey, Battle of, 1, 12, 229, 345 ; pl. 14.
Pliny the Elder (*c.* A D. 23–79), *Ency. Brit.*, 207, 220.
Plunder, 82, 293, 299, 311, 357, 367 ; *v.* Adventures.
Point Calimere, *v.* Calimere.
Poison, 159, 344, 345, 348, 356, 368.
Poland, 333.
Polaris, or pole-star, 151, 154, 165.
Police :—Commissioners of, Calcutta, 52, 53, 389 :—Superintendent of, 359 :—*thāna*, 231.
Polier, Paul Phillippe (1711–59), Mad. Inf., 364.
poligārs, or petty chiefs, (*Hobson-Jobson*), 343, 348, 358, 395.
Political :—Divisions, 114, 214, 228, 238 ; pls. 1, 9 ; *v.* Boundaries :—Missions, 31, 39, 42, 121, 184, 270 ; *v.* Chapman ; Mostyn ; Poona.
Polo, Marco (*c.* 1254–1324), 70 ; pl. 16.
Pondicherry, 1, 86, 309, 310, 314, 320, 385 ; pls. 1, 9 :—position, 169, 178, 180 :—Siege of, 1761, 87, 322, 353 :—1777, 311, 367, 386 :—1793, 112, 350.
Pons, Father (*c.* 1730), 150.
Poona, 127, 128, 129, 130, 297. 303, 335, 336, 378, 383, 384–5, 393, 397 ; pl. 1 :—Upton's Mission to, 2, 31, 121, 122 n.2, 154.
Pope, Sylvester (b. 1781), asst. revenue surveyor, 284, 286, 375.
Pope's Line, of longitude, pls. 3, 10 n.
Popham, Colonel, 395, *v.* Gwalior.
Port :—Blair, South Andaman I., first called Port Cornwallis, 48, 49, 173, 313, 328, 346 :—Cornwallis, North Andaman I., 49, 50, 346, 390, *v.* Andaman Is.
Portability of Maps, 228.
Portraits :—Dalrymple, 330 ; pl. 17 :—Orme, 360 ; pl. 18 :—Pearse, 361 :—Polier, 366 :—Rennell, 377–8 ; pl. 19 :—Reynolds, 378 ; pl. 20 :—Torriano, 393 :—Watson, 394.
Portugal, 12, 120.
Portuguese, 121 :—Astronomers, 150, 176 ; Charts, 16, 86, 129 :—Clerks, 262 :—Draughtsmen, 235 :—Jesuits 68 ns.9, 12, 69 ns.6, 8, 129, 367.
Postal services, 303–4, 309, 368.
Postmasters, 304, 309, 359.
Potatos, 48.
Pote, Edward Ephraim (1750–1832) ; Ben. Civ., 1772 ; 204.
Precious stones, 385 ; *v.* Diamonds.
Preparis I., north of Andaman Is., 16, 46.
Presents, 16, 62, 204, 297, 299, 300, 301–2, 378.
Prevost, Abbè, 176 n.6.
Price, Joseph ; ship's captain, 1775–9 ; pamphleteer ; 336.
Prince of Wales I., *v.* Penang.
Printing :—Invention of, 208 :—of Maps, 42, 167 ; *v.* Publication.
Prisoners :—with French, *v.* French :—in Mysore, 99, 341, 348, 352, 386, 395.
Private possession of Maps, *v.* Maps.
Prize-money, 266, 399.
Progress Reports, 196, 197, 262, 271, 273, 284, 296.
Projection of Maps, 216, 242, 248.
Protraction of Surveys, 183, 186, 187, 188, 189, 195, 248.
Provinces, *v.* Districts.
Provincial Maps, *v.* Maps.
Ptolemy, Claudius Ptolemaus, Greek geographer (*c.* A D. 150), 67, 71, 148, 160, 207, 208, 210.
Publication of Maps, 45, 212, 228–9, 251, 330–1 ; *v.* Printing.
Publishers of Maps, professional, 256, 259.
Pulicat, Madras (*Hobson-Jobson*), 102, 104, 238, 239, 330, 391 ; pl. 2, Paleacata ; pls. 3, 9, 12.
Pundits, 160, 161, 300, 396, 397.
Punjab, 8, 214, 232–4, 246, 333, 397 ; pls. 1 n., 8, 11, Penjab ; pl. 21 :—Rivers, 232, 233 ; pl. 10 n. :—Wilford's Map, 234, 287, 396, 397 ; pls. 8, 11.
Purangir, *gussain* or *pandit* (*Hobson-Jobson*, Gosain), 74.
Purchase of Maps, 213, 256, 259.
Purnea, 23 n.3, 32, 77, 137, 227, 308 ; pl. 14.
Pychy Rāja of Kottayam, Malabar, 132, 357.
Pybus, John (1727–89) ; Mad. Civ., 1742 ; 322, 385.

Quadrant, 14, 50, 76, 89, 153, 154, 158, 169, 170, 172, 198, 199–200, 203, 204, 205, 206, 370 ; *v.* Sextant :—Hadley's, 19, 82, 151, 171, 174, 180, 182, 184, 199, 200 :—with Stand, 172, 191, 200, 205.
Quartermaster General :—Bengal, 43, 196, 224, 326 :—Madras, 90, 257, 308, 361.
Quicksands, 26, 27.
Quicksilver, 162, 170, 200, 205, 298.
Quinine, *v.* Bark.
Qutb Minār, Delhi, 314.

Rabies, *v.* Hydrophobia.
Raghuba Rao, Marātha pretender (*c.* 1775), *DIB.*, 121.
Rainfall, 50.
Rains, *v.* Monsoon.
Rai'yat ; rai'atwāri ; *v.* ryot ; ryotwāri.
Rājahmundry, 62, 91, 105, 144, 314 ; pl. 1.
Rājmahāl, 25, 35, 37, 225 ; pl. 13, Raji-Mohol ; pl. 14 :—Hills ,25 n.2, 33, 34, 225, 310, 315, 340, 358.

INDEX

Rājputāna, 8, 132, 246, 395 ; pl. 1, Rajpoots ; pl. 11, Asmere ; *v.* Ajmer ; Jaipur ; Jodhpur.
Rāmeswaram, 87, 102 ; pl. 9.
Rāmganga R., Rohilkhand, 55, 56, 58, 359 ; pl. 6.
Rāmgarh, Hazāribāgh, 26, 35, 36, 225, 228, 294, 324, 325, 326, 336, 368, 382 ; pls. 1, 14.
Rāmnād, 90, 321, 334, 363, 387 ; pls. 1, 9, Ramanadaparam.
Rāmpur State, 8, 55–6, 160, 356, 359 ; pls. 1, 6, Rampour.
Ramsden, Jesse (1735–1800), instrument-maker, *DNB.*, 155, 165, 166, 192, 193, 200, 204, 206.
Rangāmāti, Goalpara, 22, 32, 72, 78, 80, 83, 225, 372 ; pls. 13, 14.
Rangoon, 84.
Rangpur :—Assam, 81, 399 :—Bengal, 20, 23, 77, 80, 291, 358, 371 ; pl. 14, Rungpour.
Ranks, civil and military, 266–7.
Ratanpur, C.P., 30, 39 n.12, 60 ; pl. 1, Ruttunpour.
Rausch, Daniel (d. *c.* 1798), 80, 82, 159.
Recess months, 277, 278.
Records, preservation of, vii.
Red Sea, 310, 341, 381, 398.
Refraction, 151, 156, 169.
Regis, Father (1663–1738), 70, 149 ; pl. 7 n.
Regulations :—Log-books & Charts, 45, 46, 252 :—Pay & Allowances, 275–7, 281 :—Route Surveys, 43, 196 :—Surveyor General, 256, 261–2 :—Surveyors, 197, 271, 273, 279.
Relando, Hadriano, cartographer, 208, 238.
Rennell :—1st Baron, James Rennell Rodd, grandson of John Tremayne Rodd (*qv*), 377 :—Wm. (1781–1819), Ben. Civ., 370, 378.
Rent of :—House, *v.* House :—Office, 235, 262–3, 346.
Resection from 3 known points, 192.
Resignation, temporary, 267, 315, 323, 336, 337.
Retrenchments of 1785, 5, 38, 235, 270, 274, 276, 286, 347, 367, 368.
Revenue :—Board of, Madras, 145, 146–7, 284–5, 321 :—Extortion of, 291, 295, 298 :—Settlement, *v.* Land Revenue.
Revenue Surveys : vii :—Bengal, viii, 1, 8, 13, 109, 133–41, 325, 337 :—Bombay, viii, 132, 134, 147 :—Madras, 7, 113, 114, 133, 141–7 :—Fraudulent work, 139, 140 : —Glossary, *v.* Glossary :—Inspector of, Madras, 7, 145–6, 285, 338 :—Native :—measurers, 8, 134, 138–9, 144 ; *v. amīns* :—systems, 134, 137–8, 144–5 : —Regulations, 144, 145.
Revenue Surveyors, Assistant, Madras, 7, 108–9, 194–5, 206, 284–6.
Rewah, or Baghelkhand, 29, 60, 326 ; pl. 1.
Rhinoceros (*Hobson-Jobson*), 20, 25, 26, 32.
Rice, price of, 60.
Richmond, Charles, 3rd Duke of (1735–1806) ; M G O. 1782–95 ; 317.
Ricketts, John Henry (1767–92), Ben. Engrs., 321.
Rikhikesh, on Ganges, 71 n.5 ; pl. 6, Rikikes.
Ringrose, John ; Bom. Marine, 1st Lieut. 1784 ; 123.
River :—Embankments, *v.* Embankments :—Journeys, 1, 17, 304 :—Surveys, 2, 11, 17–24, 27, 38, 50–1, 57, 59, 63–5, 182, 183, 185–9, 304, 327, 329, 333, 396 ; *v.* Ganges ; Ganges–Hooghly passage ; Hooghly ; Jumna.
Rivers of Bengal, 63, 64, 375 :—Rennell's Maps, 21, 222–3, 225, 229, 230.
Road :—Grand Trunk, 38 n.10 :—Tables & Maps, 214, 230, 261.
Roads, 38, 59, 113, 234, 238, 240, 243, 244 :—Measurement of, 10, 142, 167, 183, 184–7, 193, 220, 357 :—Pringle's Books of, 95–7, 170, 184, 287, 367.
Robbers & bandits, 60, 68, 80, 126, 129–30, 161, 175, 204, 293, 296, 301, 304.
Robins, Benjamin (1797–51), Engr. General ; F R S. ; *DNB.* ; *R E. Journal*, LVIII, March 1944(5) ; 311, 322, 364.
Robinson, John (b. 1784), asst. revenue surveyor, 284.
Roche, David (d. 1779) ; *G M.* 1774 (471) ; H M's. Foot ; 337.
Rocque, John (*c.* 1750), cartographer, 93.
Rodd :—Vice-Adm. Sir John Tremayne (m. Jane Rennell, 1809) ; De Brett's *Peerage* ; 369 :—Lady, 377.
Roe, Sir Thomas (1581–1644), *DNB.*, 71 n.8, 209, 310.
Rohilkhand, or Rohilla country (*Hobson-Jobson*), 8, 29, 34, 37, 55, 56, 58, 160–1, 163, 167, 232, 286, 318, 329 ; pl. 6.
Rohilla Wars :—1774, 34 n.7, 76, 224, 315, 325, 365 :—1794, 55, 356, 395.
Rohtas, 25, 29, 37, 223, 225, 367, 381 ; pls. 1, 13.
Ross, James (b. 1784), asst. revenue surveyor, 284, 286.
Rothmeyer, F. L., Hanoverian Sergt., *c.* 1785 ; draughtsman ; 243.
Route Surveys :—Bengal, 27–31, 38–42, 185–9 :—Bombay, 121–3, 125, 187 :—Madras, 3, 89–90, 95–100, 109–11, 115–9, 184–7 :—Rules for, 43, 196, 239, 270, 271 ; *v.* Regulations.
Roxburgh, Dr. (1751–1815) ; botanist ; Mad. Med. ; *DNB.* ; *DIB.* ; 105.
Roy, General Wm. (1726–90) ; F R S. ; *DNB.* ; *Ency. Brit.* ; 164, 165, 198, 202, 248, 318.
Royal Artificers, 316.
Royal :—Asiatic Society, viii :—Astronomical Society, viii :—Geographical Society, 377.
Royal George, H M S., 317, 330.
Royal Military :—Academy, Woolwich, 156 n.1, 189, 248, 266, 272, 311, 316, 317, 330, 333, 341, 345 :—College, Marlow, 165 n.1.
Royal Society, ix, 102, 153, 165 n.2, 319, 377, 384 n.10 : —Fellows of ; Blair, Barker, Buchanan, John Call, Dalrymple, Thomas Daniell, Davis, Hirst, Wm. Jones, Malet, Rennell, Roy, Staunton, Stewart, Troughton, Samuel Turner :—*Philosophical Transactions of*, 248, 384.
Rumbold, Sir Thomas (1736–91) ; Bart. ; Mad. Civ. ; *DNB.* ; *DIB.* ; 241, 322 ; *v.* Governors, Madras.
Rupees (*Hobson-Jobson*, Rupee ; sicca) ; *arcot* ; *sicca* ; *sonat* ; 202, 205, 274 n.3, 279 n.1.
Russians, 395.
Ryder, Colonel C. H. Dudley (b. 1868), C B. ; C I E. ; D S O. ; S G. India, 1919–24 ; viii.
Ryot, or rai'yat, (*Hobson-Jobson*), peasant, 133–4, 137–41, 144, 230, 295, 300 ; *v.* Inhabitants.
Ryotwāri system, 134, 135, 144, 145, 369 ; *v.* Land Revenue.

Sackville, Frederick (1785–1827), Ben. Inf., 39 n.4.
Sadanund's Map of Gujarāt, 123.
Safety of travel, 296–7.
Sāgar :—I., Hooghly R., 13, 159 :—Roads, 327 ; pls. 13, 14.
Sailors, *v.* Mariners.
Salary, *v.* Allowances.
Salem District, 7, 110 n.8, 113–4, 144–5, 193, 194, 273, 369 ; pl. 9, Sailum ; *v.* Bāramahāl.
Salsette I. :—Bombay (*Hobson-Jobson*), 3, 120, 121, 343, 363, 378, 383 :—Goa, 357.
Salt Lakes of Calcutta, 12, 13, 311.
Salween, Lukiang, or Martaban R., 84, 85, 316 ; pl. 3, Manthabam.
Sambalpur, 30, 41, 153, 223, 309, 352, 359 ; pls. 1, 13, Sumelpur.
Samru, or Walter Reinhard (*c.* 1760) (*Hobson-Jobson*), *DIB.*, 345 n.8.
Sanpo R., *v.* Tsang-po.
Sanscrit literature, 156, 160, 208, 268, 319, 320, 366, 383, 396 ; *v.* Hindu.
Sanson, French cartographers ; Nicolas, Guillaume & Adrian (1600–1718), 67, 209 ; pls. 11, 12.
Santāl Parganas, 34 n.9, 225, 326, 366 ; *v.* Jungleterry.
sanyāsi fakīrs (*Hobson-Jobson*, Sunyasee), 23, 257, 283, 292, 300, 371, 372, 374, 381.
Satellites, *v.* Jupiter.
Saunders, Dr. Robert, Ben. Med., 1782–90 ; Crawford's *List* ; 74, 77.
Saussure,—asst. to Engr., Madras, 93.
Sayer & Bennett, map publishers, 227.
Scale of :—Maps, 15, 51, 208, 210, 213, 214, 218, 226, 227, 228 n.6, 246, 247–8 :—Surveys, 13, 37, 141, 182, 183, 187, 189, 193, 247.

Index

Schall, Father Adam (1589–1666), S J., 149.
Schereseddin, historian, 15th century, 71 n.4.
School, *v.* Surveying School.
Science Museum, South Kensington, 166 n.4, 201.
Scott :—Col. Caroline Frederick (d. 1754); Engr. General, 1753–4 ; *DIB.* ; Sandes : 51, 93, 364, 395 :—Mad. Est. *c.* 1780, 110.
Scrafton, Luke (d. 1769 at sea), Ben. Civ. ; *DIB.* ; 51.
Scurvy, 48, 338, 370.
Sea, Deaths at, 38 n.14, 310, 315, 323, 332, 339, 352, 354, 355, 356, 359, 361, 382, 383.
Seaforth, Kenneth Mackenzie, Earl of (*c.* 1744–81), 99 n.1, 349.
Sea-passages ; Calcutta–Madras, 101, 303, 328, 332 :—Europe–India, 303, 309, 339–40 :—to Far East, 303, 330, 339, 370 :—West Coast, 303, 324.
Secrecy :—Maps & Plans, 15, 227, 256, 257, 262, 273 :—Surveys, 6, 75, 116, 121, 127, 156, 297, 299, 315.
"Select Picket", 266, 325.
Sepoy Detachments, 23, 90–1, 292, 293, 294–5.
Sepoys :—on Escort, 60, 61, 62, 159, 291, 294–5, 299, 300 :—Objection to sea-travel, 40, 343, 362 :—Women-folk on service, 60, 61.
Seringapatam, 7, 89, 98, 110, 112–3, 118–9, 129, 130, 249, 328, 334, 335, 337, 360, 386 :—Capture of, 4–5–99 ; 9, 118, 308, 312, 328, 337, 341, 351, 383 :—Position, 177 :—Treaty of, *v.* Treaty.
Settlement of Revenues, *v.* Land Revenue :—Permanent, *v.* Permanent :—ryotwāri, *v.* Land Revenue.
Sextant, 148, 151, 155, 158, 162, 163, 165, 168, 175, 177, 178, 182, 198, 199–200, 204, 205 :—Hadley's, 170, 174, 180, 191, 192, 200, 206 ; *v.* Quadrant.
Shāh Alam (1738–1806), Shāhzada & Emperor of Delhi ; *DIB.* ; 24 n.6, 301–2, 345, 348.
Shāhjehān, emperor of Delhi, 1627–58, 234.
Shahābād District, 33, 37, 141, 225, 367, 383.
Shakespeare, Wm., poet & playwright, 383.
Shan States, Burma, 84.
Sharks, 49.
Sheep, 62.
Sherwill, W. S. (1815–90), Ben. Inf., 21 n.5.
Shipbuilding, 20 n.9, 103, 303, 333, 343.
Ships :—Logs, 45, 251, 331, 390 :—Sailing, 46, 47 n.1, 66, 102–4, 125, 269, 303, 324, 336, 381, 385, 389, 390, 392, 394 ; *v.* Indiamen :—wrecked or lost, 5, 14, 45, 50, 101, 104, 160, 268, 310, 339, 353, 354, 355, 382.
Shoals :—in rivers, 18, 27, 51 :—of Armagon & Pulicat, 16, 102, 104, 105, 391 ; pls. 3, 9, 12.
Shore, Sir John (1751–1834), 1st Baron Teignmouth ; Ben. Civ., 1769 ; *DNB.* ; *DIB.* ; 81, 141, 217, 281, 282, 342 ; *v.* Governor General.
Short Sight, 335.
Shuja-ud-Daula (1731–75), *DIB.*, 315, 365, 366 ; *v.* Oudh.
Siam, 85, 314.
Sickness, or ill-health, interrupting survey, 18, 57, 158, 159, 161, 325, 335, 342, 348, 364, 385.
Sidu Harbour, Sumatra, 47–8, 345–6.
Signalling, visual, 311, 368 n.8.
Signals, 104–5, 191, 192, 194 ; *v.* Flags.
Signature of Surveyor, 183.
Sikhs, 58, 302, 366 ; pls. 1, 8, Seiks :—Map of Country, 42, 233, 381.
sikligār (*Hobson-Jobson*, Sicleegur), knife grinder, 262, 290.
Silk industry, 225.
Sind, 8, 234, 246 ; pl. 4 :—Coast, 123, 313.
Sindhia, Marātha Chief ; Mahādji Rao (1730–94) ; *DIB.* ; 6, 56, 116, 121, 123, 126–7, 302, 324, 378, 379, 386 :—succeeded in 1794 by Daulat Rao (1779–1827), eventually Māhārāja of Gwalior :—Country of, 42, 55, 340, 379.
Singapore, 330.
Singraula, south Mirzāpur, 60 n.7.
Sketches, or views, by :—Anburey, viii, 43, 309 :—Colebrooke, 112, 187, 328–9 :—others, 73, 159, 229, 308, 310, 313, 321, 339, 351, 353, 390, 392 ; pl. 9 n. ; *v.* Artists ; Etchings.
Skynner, W. Augustus (*c.* 1780), Bom. Marine, *I O. Tract 397*, 123.
Slaves (*Hobson-Jobson*), 49, 323, 334, 336, 364, 366.
Smith :—Cecil (1772–1813) ; Mad. Civ., 1789 ; 393 :—General Joseph (*c.* 1733–90), *DNB.*, 90, 95 n.3 :—Brig. Richard (d. 1803) ; C-in-C., Bengal, 1768–70 ; Holzman ; 24, 25, 26, 29, 211, 222, 322, 340, 360, 384, 395 :—William Bruce, merchant, arrd. India *c.* 1780, 77.
Smith, or brazier, 290, 301.
Snakes, 19, 44, 158.
Snow :—sailing vessel, 16, 47 n.1, 87, 370 :—upon the mountains, 68, 76–8.
Snowy Range, of Himālaya, 76–8 ; pl. 21 ; *v.* Peaks.
Son R., 25, 29, 60, 221, 223, 315, 333, 360, 382, 383 ; pl. 1, Soane ; pl. 13, Son-su.
Sonda, North Kanara, 131 n.1, 357.
Soundings :—Marine survey, 16, 66, 87, 102, 103, 104, 125, 184, 192 :—River survey, 50, 54, 66, 398.
South Peninsula, *v.* Peninsula.
Spanish, 330, 336.
Speke, John Hanning (1827–64), explorer, *DNB.*, 397.
Spelling of Names :—personal, 249 :—of places, *v.* Orthography.
Srīnagar :—Garhwāl, 73, 78, 320, 338 ; pls. 6, 8 n., 21 :—Kashmīr, *v.* Kashmīr.
St. Helena, 312, 356, 374, 383, 385, 398.
St. Lublin, Chevalier (*c.* 1780), 397.
St. Thomas' Mount, Madras, 41.
Stancliffe, instrument-maker, 171, 175, 191.
Standard Measures, 182, 191, 194, 195, 198.
Stands for Measuring rods, 191.
Starvation, *v.* Famine.
Stationery supply, 276.
Staunton, Sir George Leonard (1737–1801) ; Sec. to Macartney's mission to China, 1792–4 ; F R S. ; *DNB.* ; 99.
Sterling exchange, 274, 275, 278, 280, 281 n.10.
Stevenson :—Maj Gen. James Daniel (d. 1805) ; Mad. Cav., Capt. 1784 ; 357 :—Wm. (1739–65) ; Mad. Engrs. 1757 ; 386.
Stewart, John (1749–1822) ; Mad. Civ. 1763 ; F R S. ; *DNB.* ; *Ency. Brit.* ; 74, 80 n.3.
Stibbert, General ; C-in-C. Bengal 1784–6 ; 397.
Stone marks, or Bench-marks, 192.
Storage of Maps, *v.* Custody.
Storms, 18, 27, 124, 162, 390.
Strabo, Greek geographer, 220.
Stratton, George (1733/4–1800) ; Mad. Civ. 1751 ; recalled, 1776/7 ; 92.
Street names, 52, 53, 94, 95.
Ströbel, Father, astronomer, *c.* 1740, 150.
Stuart :—General James ; *DNB.* ; *DIB.* ; 96 :—Joseph (1741–1815) ; *DNB.* ; *Royal Mil. Calendar* ; 95 n.4, 279.
Stud at Pusa, 332.
Subsidiary Force, *v.* Nizām.
Suez, 303, 397, 398.
Suffre(i)n St. Tropez, Admiral Pierre Andrè de (1729–88) *DIB.* ; *Ency. Brit.* ; 383.
Suicide, 24 n.5, 388.
Sulphur, 47.
Sultanpett *tope*, Mysore, 351.
Sulu Is., NE. of Borneo, 330, 339.
Sumatra, 47 ns.2, 3, 153 n.10, 345, 390 ; *v.* Achin ; Sidu.
Sundarbans (*Hobson-Jobson*), 2, 13, 14, 15, 18 n.9, 63 159, 225, 227, 229, 318, 364.
Sunrise & Sunset, 76, 77, 192, 230.
Supplies, 40, 60, 62, 158–9, 291, 296, 299.
Supravisors, or supervisors, 136, 137, 138, 266.
Suraj-ud-Daula (1731/6–57) ; Nawāb of Bengal ; *DIB.* 249 n.1.
Surat (*Hobson-Jobson*), 4, 11, 120, 121, 122, 124, 149, 302, 333, 385, 387, 388 ; pls. 1, 2, 3, 11, 12, 16 :—position, 149, 176 ; pl. 10 n. :—Reynolds' hdqrs., 8, 126–8, 132, 219, 258, 357.
Surgeons & Doctors, 41, 56, 74, 84, 126, 267, 315, 340 *v.* Cruso ; Gilchrist ; Hunter ; Saunders.

INDEX

Survey :—Definition, 89 :—closed down, 34, 38, 277, 286 :—of England, 317 :—Methods of, 182–95 :—unwelcome to Nawāb of Carnatic, 90–1 :—Ships, 15, 16, 17, 47–9, 102–4, 123–4, 125, 313, 355 :—reliability of, *v.* Accuracy ; Errors :—welcomed by Nawāb of Oudh, 58.

Surveying School, Madras, ix, 7, 108, 114–5, 174, 194, 199, 268, 283–5, 338, 389, 392 :—Boys from, 109, 114–5, 117, 145–7.

Surveyor Generals :—Bengal :—Rennell, 31–2, 260, 369, 371 :—Richards, 260, 381 :—Thomas Call, 37, 260, 323 :—Mark Wood, 43, 260–1, 397, 398 :—Kyd, 43, 261, 327, 346 :—Colebrooke, 55, 261, 329, 396, 398 :—Bombay, 265, 378, 379 :—Field Armies, 4, 9, 118, 273, 312, 378 :—of India, 260, 352 :—proposed for Madras, 108, 119, 263–5, 343, 350, 352, 391–2 :—Office, Calcutta, 235–7, 258, 262–3, 271, 290, 314, 327, 329, 394, 398, 400 :—form of Plural, 260 n.1 :—Relations with Government, 260, 262, 274.

Surveyor of :—Rivers, *v.* Allowances :—Works, 363–4.

Surveyors :—Bengal, 33–4, 36, 182–3, 269–71 :—Bombay, 273 :—Madras, 108, 170 n.6, 271–3 ; *v.* Revenue Surveyors :—"out of the Service", 268–9 :—Military Officers, 266–8, 269 :—unsuccessful, 137, 197, 273 :—Indian :—with Reynolds, 132, 218, 234, 282, 287–9, 302, 379 :—with other surveyors, 234, 286–7, 397 ; *v.* Explorers :—on Revenue & Tank Surveys, 144–5, 284.

Suspension for misconduct, 314, 356, 359, 364.

Sutlej R. (*Hobson-Jobson*, Sutledge), 68, 70, 72, 232 n.7 ; pl. 8, Setlege.

Swedes, 314, 333.

Switzerland, 314, 364, 387, 395.

Sydenham, Wm. (1752–1801) ; Mad. Art. ; *DIB.* ; 361, 387, 394.

Sylhet, 32, 33, 82, 83, 225, 372 ; pls. 1, 14 :—Revenue Survey of, 140.

Symbols, 221, 224.

Symes' Embassy to Ava, 8, 84, 316, 399.

Tables :—Astronomical, *v.* Astronomical :—Distances, *v.* Distances :—Geographical Positions, *v.* Geographical.

Tamil language, 249.

Tandy, Sir Edward (b. 1871) ; R E. ; S G. 1924–8 ; vii.

Tanjore, 86 n.7, 133, 241, 321, 335, 338, 387, 392, 395 ; pls. 1, 9, 12, Tanjaor :—Anicut, *v.* Anicut :—Maps & Surveys, 86, 95, 238, 243 :—position, 170 :—Siege of :—Oct. 1771, 358 :—Sept. 1773, 90, 93, 337, 358, 386.

Tank Repairs :—Department of, 107–9 :—Superintendent of, 108, 114, 146, 286, 321, 392.

Tanks (*Hobson-Jobson*), or reservoirs, 142, 146, 187, 189, 284, 391.

Tartary & Tartars, 67, 74, 223 ; pls. 7 n., 11.

Taxila, Punjab, 232.

Taylor, Wm. Cheke (d. 1778), Ben. Inf., 1767, 293 ; less likely to be Thos. Taylor, Ben. Inf., (d. 1769 ; Lieut. 1773 ; d. Cooch Behār, 1773.

Tea, 373.

Teak, 58, 103, 105, 303, 348, 391.

Teignmouth, *v.* Shore.

Telegraph Towers, *v.* Signalling.

Teliagarhi Pass, 25 n.2, 162 ; pls. 13, 14.

Tellicherry, Malabar, 125, 130, 308, 324, 332, 346, 356, 367 ; pls. 1, 9.

Tenasserim coast, 46, 340.

Tent, 389 :—Allowance, 279–80 :—Transport, 289.

Terrestial Attraction, 156, 316.

Terry, Rev. Edward (1590–1660), *DNB.*, 71.

Teshu Lama of Tibet, 74.

Test, Wm., Bom. Marine, 49 n.7, 313.

Thackeray, Wm. Makepeace :—Ben. Civ. (1749–1813), 366, 369, 373 :—novelist, his grandson (1811–63), 373.

Theodolite :—Bearings & intersenctions, 7, 58, 170, 186, 187, 188, 189, 194 :—Compass, 172, 200.

Theodolites, 90, 165, 182, 185, 193, 198, 201, 204, 205, 206, 279, 326, 399, 400.

Thermometers, 158, 194, 204, 205, 206, 362, 389.

Thevenot, Melchezedek (*c.* 1650), 118, 221 n.2, 232.

Thomas, Father, 169, 176.

Thomas's journey from Nāgpur, 1782, 39–40, 296–7.

Thuillier, Sir Henry Landor (1813–1906) ; Ben. Art. ; K C S I ; F R S. ; S G. 1861–77 ; *DIB.* ; vii.

Tibet, 23 n.5, 32, 67, 68, 69–71, 73–5, 80, 223, 314, 332, 394 ; pls. 7 n., 14 ; *v.* Lhāsa :—Maps of, 1, 67, 71, 209, 210 ; pl. 7.

Tidal observations, 103, 177, 347.

Tigers, 19, 20, 25, 26, 32, 58, 296.

Timbrell, Andrew (1768–1850), ship's captain, 202.

Time :—observations for, *v.* Astronomical obsns. :—for computation of Distances, *v.* Distances.

Time-keepers, 151, 155, 158, 159, 160, 165, 173, 195, 202–3; *v.* Chronometers ; Clocks.

Timūr :—Emperor (captured Delhi 1398), 232 :—Shāh, of Kābul (d. 1793), 55, 161.

tindals (*Hobson-Jobson*), 289.

Tinnivelly, 87, 98, 239, 341, 358, 361, 363 ; pl. 9.

Tipu Sultān of Mysore (1753–99), *DIB.*, 4, 6, 7, 9, 43, 98, 99, 110, 111, 113, 125, 127 n.5, 130, 131, 132, 145, 308, 312, 343, 346, 391, 398 ; pls. 1, 21.

Tista R., 20, 21, 23, 24, 36 ; pls 5, 14.

Todar Mall, Akbar's minister, 133–4, 135.

Tolls, navigation, 63, 65 n.7, 356.

Tolly's Nullah, 63, 64, 65.

Toone, Sweny (1746–1835) ; Ben. Inf. 1764 ; G G.'s Bodyguard 1773 : Director, E I C. 1798–1801 ; 224.

Topographical Survey, 88, 108, 114, 119.

Topping, Timothy (b. 1781), mariner, 393.

Torriano, Wm. Harcourt (1749–1820), Mad. Civ., 94, 360.

Torsedillas, Treaty of (1494), pl. 10 n.

Tower of London School for Artillery cadets, 156, 316, 317.

Town Major :—Calcutta, 345 :—Madras, 111, 312, 389.

Towns :—List of, 187 :—large-scale Surveys of, 87, 239 ; *v.* Calcutta, Madras.

Tracing :—Glass, 205, 216 :—Paper, *v.* Paper.

Trade, 73–4, 80, 203, 275, 314, 330, 332, 359, 364, 370, 372–3 ; *v.* Commerce.

Training of Surveyors, 182, 267, 270–1.

Transliteration of names, *v.* Orthography.

Travancore, 96, 130, 238, 241, 242, 343, 367, pls. 1, 9 n., 12.

Traverse :—Circuits, 142, 189, 190 :—by Perambulator, 4, 5, 7, 31, 41, 112, 184–9, 362, 395 ; *v.* Perambulator.

Treaties :—with :—Nawābs of Bengal, 1757–60, 1, 12 n.7, 21 n.7, 135, 136 :—Emperor of Delhi, 1765, 24, 91:—Nizām, 1768, 91, 111 :—1790, 115 :—Marāthas :—Porandhar, 1776, 121 :—Salbai, 1782, 121, 125 :—1790, 115, 116 :—Mysore, Seringapatam, 1792, 7, 113, 118, 131, 244, 375.

Trees, obstructing vision, 102, 186, 191, 343.

Treeves, Pellegrin (1762–1825) ; Ben. Inf., Cad. 1781 ; resd. 1782 ; Ben. Civ. 1784 ; 339.

Triangulation, 6, 99, 102–3, 112, 114, 142, 183, 185, 190–1, 192, 194–5, 199, 376, 389.

Trichinopoly, 86, 90, 185, 311, 321, 335, 336, 341, 358 ; pls. 1, 9 ; Position 170.

Trigonometrical Survey proposed, ix, 166, 190, 389.

Tripura, or Tipperah, 67 n.1, 83, 225 ; pls 2, 14, Tipera.

Troughton, Edward (1753–1835); instrument-maker ; F R S., *DNB.* ; 201, 202.

Tsang-po R., 69, 74, 84, 209 ; pl. 7 n. :—identity with Brahmaputra, 69, 72, 74, 79–80, 314, 375, 392 ; pls. 1, 7, 14.

Tsaparang, on upper Sutlej, 68 ; pl. 6, Chaparang.

Tungabhadra R., 7, 109, 115, 116, 129, 335 ; pl. 9.

Turing, John (1744–1808) ; Mad. Civ. 1762 ; to England, 1792 ; 173.

Turkish Geographers, 148, 232.

Turkistan, country of the Turks, 208.

Turnbull, Thomas (b. 1782), asst. revenue surveyor, 109 n.1, 114, 195, 284, 286.

Turtles, 159, 327–8.

Twenty-four Parganas (*Hobson-Jobson*), 135–6, 137, 139:—Cession of, 1, 135 ; pl. 1, refs. :—Survey, viii, 2, 12–3, 324, 337 ; *v.* Calcutta Lands.

Ujjain (*Hobson-Jobson*, Oojyne), 6, 56, 126, 150 ; pl. 1, Ougein ; pl. 10, Usen ; pl. 11, Ougel :—position, 151.
Ulugh-beg (d. 1449), astronomer, 148.
Undwah Nala, Battle of, 229, 345, 353 ; pl. 14, Oudanulla.
Uniform, 302.
United Service Club, Calcutta, 347.
Units of Measure, 134, 135 ; *v. bigahs*; Geographical miles ; *hāth* ; *koss*.
Upper Provinces of Bengal, 230, 232.
Upton, Colonel John, 385 :—his Mission to Poona, *v.* Poona.

Valentia, Lord, George Annesley (1770–1841) ; visited India 1803 ; *DIB.* ; 347.
Valentyn, François, cartographer *c.* 1700, 221.
van Bleau, cartographer, 221.
Vansittart, Henry (1732–69/70) ; *DNB.* ; *DIB.* ; 17 n.11, 30, 251, 309, 339, 371 ; *v.* Governor of Bengal :—collection of Maps, 211, 222, 223, 250 n.5, 339, 345.
Variation of Compass, 26, 59, 66, 81, 151, 152, 156, 168, 175, 177, 178, 182, 184, 185, 186, 188, 192, 200, 201, 390.
Venetian Geographers, 208 n.6 ; *v.* Italians.
Venus, transit of ; *I O. Tract 44*, 3–6–1769 ; 153–4, 169, 180, 200, 339, 364.
Verelst, Henry (d. 1785) ; *DNB.* ; *DIB.* ; 22, 26, 27, 33 n.1, 137, 372 :—expedition to Cāchār, 23, 82, 151, 364 ; *v.* Cāchār.
Verniers, 199, 201.
Victoria Memorial Hall, Calcutta, 308 n.10, 328, 354, 371, 377.
Views, *v.* Sketches.
Vignola, *v.* Cantelli.
Vigors, Urban (1747–1815) ; Mad. Inf., 1768 ; 344.
Villages, 141, 142, 145, 193, 195, 226 :—statistics of, 146.
Vincent-Maria, Father, 86.
Visscher, Nicolaum, cartographer, 209.
Vizagapatam, 41, 59, 91, 320, 363, 382, 385, 391 ; pls. 1, 12, Vixaopatan :—position, 155 :—Survey & Maps, 92–3, 143, 246, 342, 363.
Volcanos, 30, 47, 327.

Wade, James ; Hooghly Pilot ; pension Rs. 120 p.m. from 1803 ; 51.
Wadgaon, disaster of, 121, 386.
Wainganga R., 8, 30 n.12, 60.
Wales, John (d. 1810), Bom. Marine, 49 n.7, 124, 313.
Walker :—James, map-engraver, 104 n.6 :—Maj Gen. James Thomas (1826–96) ; C B., F R S. ; Bom. Engrs. 1844 ; S G. & S T S. 1878–84 ; vii, ix.
Wandiwāsh, Carnatic, 86, 99, 311, 320, 329 ; pl. 9, Vandivash.
Warangal, Nizām's Dominions, 92, 115, 116, 170, 337 ; pl. 1, Warangole.
Ward, Benjamin Swain (1786–1835), Mad. Inf., 350.
Warren, John (1769–1830), H M's. 33rd Foot, 215 n.2, 375, 376.
Watches, *v.* Chronometers ; Timekeepers.
Water, fresh, 390.
Watercourses, Survey of, 142, 145, 146.
Watson, Admiral Charles (1714–57), *DNB.*, 12, 388.
Waugh, Andrew Scott (*c.* 1807–77) ; K C B. ; Ben. Engrs. 1827 : S G. & S T S. 1843–62 ; vii, ix, 36.
Wazīr of Oudh, *v.* Oudh.
Webbe :—Charles (1782–98), asst. revenue surveyor, 284, 285 :—Josiah (1768–1804) ; Mad. Civ. ; *DIB.* ; 264 :—Wm. (b. 1784/5), asst. revenue surveyor, 284, 286, 375.
Wellesley :—Richard Cowley (1760–1842) ; 2nd Earl of Mornington 1781 ; 1st Baron Wellesley 1797 ; 1st Marquess 1799 ; *DNB.* ; *DIB.* ; 347, 371 ; *v.* Governor-General ; Mornington:—the Hon.:—Arthur (1769–1852) ; future Duke of Wellington ; *DNB.* ; 118, 264, 308, 341, 351, 357, 376 :—Henry (1773–1847), *DNB.*, 264.
Welsh :—James (1775–1861), Mad. Inf., 219, 350, 380 : —Thomas (d. 1822), Ben. Cav., 8, 80–2, 398, 399 ; *v.* Assam.
West Coast, 6, 123–5, 176, 178, 203, 310, 340, 355, 389 ; *v.* Malabar.
Western :—Ghāts, 98, 125, 129, 367 ; pls. 12, 21 :—India, Map of, *v. Map of Hindoostan*, Reynolds.
Westminster Abbey, 101 n.9, 377.
White ; Professor Joseph, *DNB.*, 333 :—a Journey from Nāgpur, 39.
Whitehill, John (b. 1735) ; Mad. Civ. 1752 ; actg. Govr. of Madras 1777, 1780 ; dism. 1780 ; 303.
Williams, Monier (1777–1823) ; Bom. Inf. ; S G. Bombay, 1807–15 ; 7, 132.
Witt, de, cartographer, 209.
Wood Street, Calcutta, 352, 400.
Wounded Officers, 23, 292, 321, 338, 342, 355, 358, 367, 371, 378, 381, 395.
Writer (*Hobson-Jobson*) :—Clerk, 280, 301 :—junior grade of civil service, 266.
Wynād, Malabar, 131, 132 n.3, 357.
Wyld's Map of Peninsula, 99, 113 n.3.

Yarkand, 68.
Yule :—Sir Henry (1820–89), *DNB.*, 168 n.4, 377 :—Udny (*c.* 1766–1830), Ben. Inf., 168 n.4.

Zamān Shāh, of Kābul (*c.* 1800), 55, 57–8, 218, 232, 399.
zamīndars (*Hobson-Jobson*, Zemindar), 105, 133–5, 137–41, 144, 291.
Zenith Sectors, 165, 166, 316.
Zoffany, Johann (1733–1810), artist of Ratisbon, 366.

